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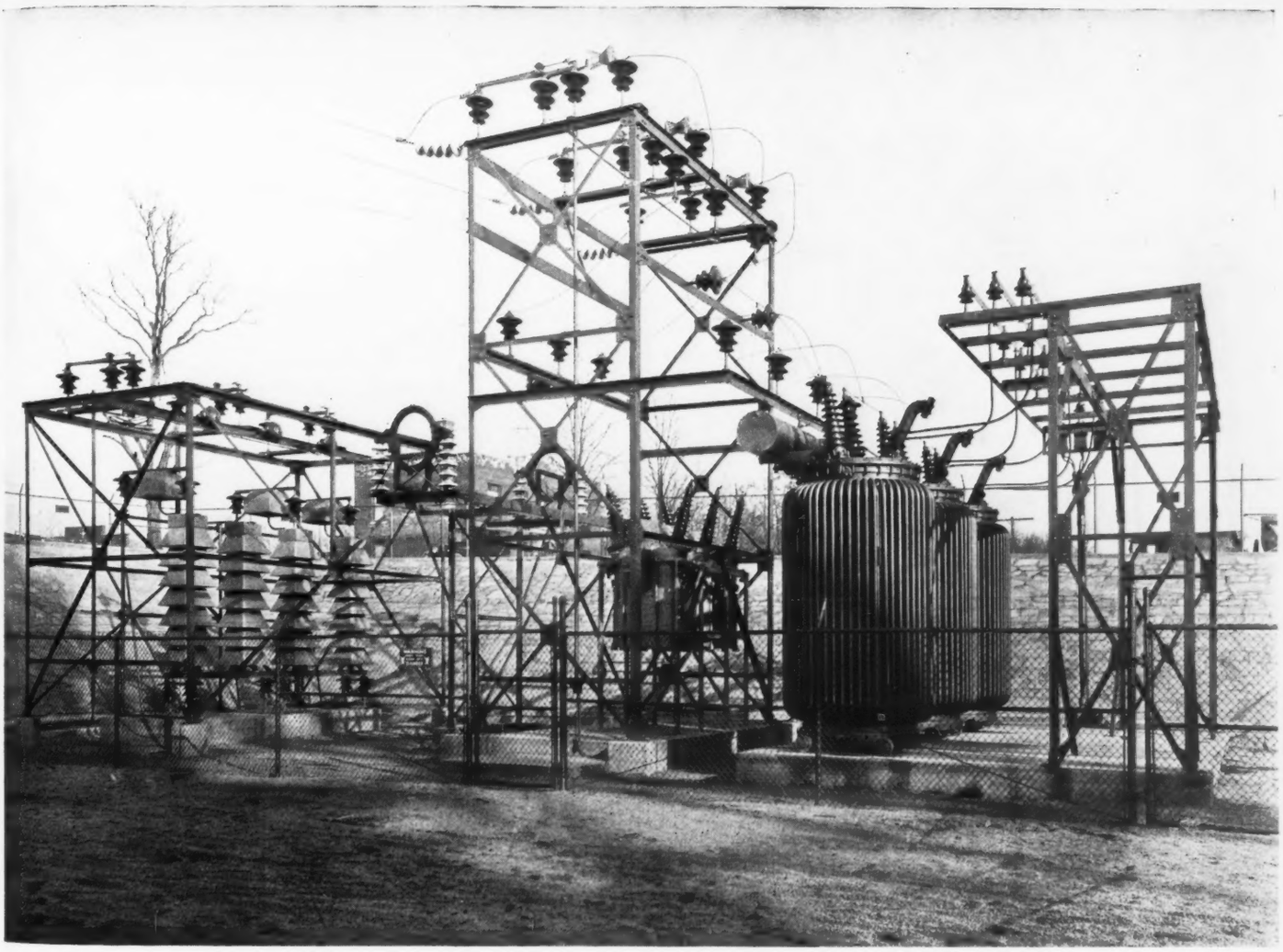
ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS



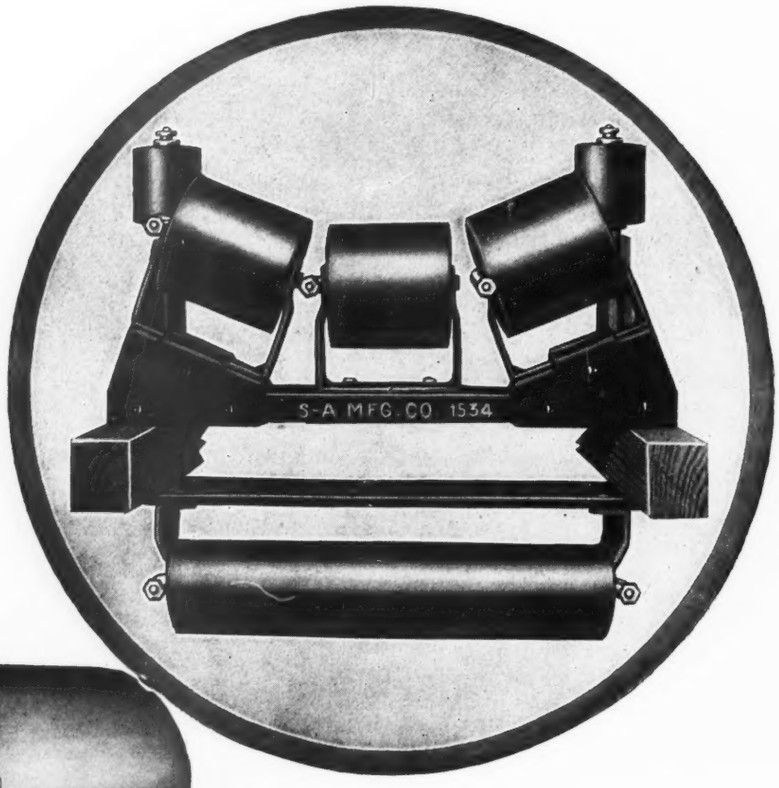
The Retsof Mining Co., an important salt producer at Retsof, N. Y., is proud of its electric equipment. Minute attention has been paid to working out details. The photograph shows the transformer station.

A Model Salt Mining Plant at Retsof, N. Y.
By Arthur B. Parsons

Coal as an Aid in Oil Exploration
By Ernest R. Lilley

Rod Mills and Unnecessary Sliming
By Will H. Coghill and C. O. Anderson

Milking Millions from the Mill, or Strong for Philanthropy



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You can have'em either way!

S-A Unit Carriers are so well known in the metal mining field that the mere name suggests efficient ore conveyance. The popular S-A Ball Bearing Unit Conveyor Carrier is now available with fittings for high pressure lubrication. The new pressure lubricated unit is interchangeable with the old style and the change from one to the other is simple. Many will prefer the new type; some will be content to continue with the old. The point to remember is that now you can have 'em either way!

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STEPHENS-ADAMSON MFG. CO.
AURORA, ILL.

ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 117 | New York, June 21, 1924 | *Number* 25

Complete Metal and Mineral Quotations

FOR SEVERAL YEARS the *Mining Journal-Press* has been building up its marketing service, so that the mining industries might be aided in their problems of disposal of their products. Our quotations of current prices of metals and minerals now cover 103 of such commodities. As the reader glances over these quotation pages, he is perhaps unimpressed. Each metal or mineral occupies only a little space, and the details of price and specifications and location of marketing are given tersely. Yet these are all original quotations, derived from our own sources, developed slowly by patience and persistance. We are the only journal in the world which has ever quoted or attempted to quote prices of metals and minerals in full.

It is generally known, of course, that our quotations on copper, lead, and zinc are original and that they are the recognized standard, not only by the industries, but by the United States Government, and even by South American courts. During the last two years, we have had the personal co-operation of representatives from the Bureau of Mines and the Department of Commerce in establishing these quotations. But the work we have done in building up quotations of the less common mineral commodities has not been specifically brought to the attention of our readers. A short time ago we received a letter from producers of monazite and zircon in India, stating that we were the only journal in the world that carried quotations on these minerals, and they accordingly depended on us. More recently a dealer in minerals and ores found himself in a lawsuit concerning the payment for chemical manganese delivered in 1920. After a search for evidence as to the current prices at the times of delivery, he found that the only sound evidence he could offer were the quotations of the *Mining Journal-Press*. These were at once recognized by the court as a basis for settlement.

Many of the minerals and metals, never before regularly quoted in detail, have markets that are far from free and uniform. Such, for example, are asbestos, bauxite, feldspar, mica, and the like. While the metals may be quoted as to a fairly uniform quality and at a recognized market center, commodities of the type of feldspar and mica vary in value according to the distance from markets, their grade as to quality and sizing, and according to local and regional physical and chemical variations. Such differences we have to meet by quoting f.o.b. the various producing districts.

Having succeeded in establishing a price quotation for most of the metals and minerals which the mining industries produce, we have lately been busily engaged in mopping up the corners of the market problem. We are constantly getting on the trail of a market price for some new and relatively uncommon mineral commodity never before publicly quoted, and sometimes previously almost without a known market. A few months ago we made the first quotation for beryl—not gem beryl, but industrial beryl, by the ton. Recently we made our first quotation on ozocerite, or mineral wax. Not long ago we succeeded in getting in touch with reliable quotations on manjak, a natural asphalt from Barbados, and on garnet.

This is a service of interest to all our readers, from the executives to the prospectors. We want you to know that none of these quotations are clipped, and with what labor we have built up the only complete system of metal and mineral quotations in the world. From the above general statement we must, it is understood, exclude silver, whose quotation is primarily determined in London and whose American quotation is fixed by Handy & Harman, of New York, silver merchants through whose hands passes most of the raw silver used by manufacturing consumers in the United States.

The Mining Center of the United States

THOSE WHO HAVE CONSIDERED MINING in the United States as essentially a Western enterprise should do a bit of traveling. Let them start on the western slope of the Mississippi Valley and visit first the lead-zinc district around Joplin and Miami. There in the middle of a green well-watered country are a half dozen camps—among them Picher—as wild and weird a looking place as ever figured in Western fiction. This district, with its grotesque elevators for piling tailings on the almost level plain, produces 70 per cent and more of the slab zinc of the country. Much of its practice might be termed "home made," but for all the differences that strike the Westerner as odd, it is efficient and well adapted to conditions.

A little further east will bring them to the greatest lead-producing district of the United States—Southeast Missouri, with its mines, mills, and smelters—a region of which the average mining man has little first-hand knowledge. Thence north to the lead-zinc camps around Platteville, in the upper Mississippi Valley. Continuing north, the great iron ranges of the Mesabi, Cuyuna, and Vermilion, with their gigantic scale of operations, are reached, and, east of them, the Michigan trio—the Gogebic, Menominee, and Marquette. Close by, in the Keweenaw peninsula, jutting out into Lake Superior, is the famous Copper Country of northern Michigan, with its deep mines, some of the world's deepest shafts, and the huge machinery of its surface plants, unparalleled elsewhere in the country.

If our Westerners, traveling east in quest of light on mining, choose to cross the border at Sault Ste. Marie, a short ride will bring them into Sudbury, the world's greatest nickel-producing center. Not far northeast lies the famous silver camp of Cobalt, and still further into the northern bush, but not very far at that, are found the gold camp of Kirkland Lake and that of Porcupine, with the Hollinger, the largest gold mine in the world today—all within a day's ride of New York.

But should the travelers choose to leave Ontario and its world beaters in nickel, gold, and silver mining until

a later day, they might pass down into the Empire State—New York—never famed as a mining state, but nevertheless possessing one of the country's greatest zinc producers at Edwards, near the Canadian border, as well as salt mines, iron mines, talc mines, and numerous other non-metallic properties. Now traveling south, they might take in the iron mines of New Jersey and at least pass by the great zinc property at Franklin Furnace, which has long made New Jersey the second zinc-producing state of the Union—all a short distance from the home of the *Mining Journal-Press*.

And still continuing south to complete their reconnaissance of the mining industry of the East, they will find the trip most pleasant in the merrie month of May. In Tennessee, a half hour's ride from Knoxville, the zinc camp of Mascot will astonish them—another place of which little has been heard and less written, though deserving wide publicity. One hundred miles south lies the Ducktown basin—a bit of Arizona scenery amid the Southern hills, the desert effect due to deforestation and old-time practice at the smelters—where copper mines, smelters, flotation plants and sulphuric acid plants are intermixed. Sixty miles to the south lies Cartersville, in Georgia, a remarkable mining district, where the country's largest ocher and barytes mines are situated and where, near by, manganese and iron are mined. Elsewhere in the state, not a great distance away, bauxite, kaolin, fuller's earth, and other non-metallics occur in important deposits, which are worked. At many places, moreover, through the South, phosphate mining may be observed.

And then, for a great and glorious finish, our Westerners might visit the wonderful Birmingham district, with its iron ore, coal, and limestone in marvelous juxtaposition, its coke ovens, blast furnaces, mills and manufacturing plants, and its railroad network—all based on its mining, and in a fertile country.

Then mining might seem less like an essentially Western enterprise to the travelers, and they would see with greater ease than ever why the *Mining Journal-Press* continues to keep its headquarters in the East, though seeking to serve the mining industry of the entire country and, indeed, the world.

Increasing Use of Rubber

THOSE WHO ARE WORKING to widen the uses of copper, zinc, nickel, and pure iron—to quote some of the metals that have received particular attention from advertising and commercial research men—should be encouraged by the progress that has been made in a campaign for increasing the outlet of rubber. Or, looking at the matter another way, they may find cause for discouragement, for rubber promises to encroach seriously on certain fields that have so far been the exclusive property of metals and some non-metallic materials.

The rubber situation has been somewhat akin to that of copper: nothing has been wrong with consumption, but production has more than kept up with it, so that prices are now about 20c. per pound, whereas before the World War they were around 50c., possibly much too high. Naturally, such a great drop in price, in itself, has stimulated consumption and increased the uses to which this vegetable gum has been put, but the rubber-manufacturing companies have not been slow to develop their opportunities. Had the copper or the zinc producers had a similar great drop in price on which to build a new market, these metals would have developed a much wider field of application.

Of particular interest, of course, is the use of rubber as a lining for ball mills, a development of great promise, though such linings have so far had such limited use that it is too early to say that they are better than steel. Now that the Goodrich company is putting rubber lining material on the market in commercial form, many operators will no doubt try it, and we shall know before long whether the excellent results of J. J. Denny's early experimental work can be generally substantiated. Rubber linings and impellers for centrifugal pumps have proved their advantages over metal where erosive pulps must be handled. Rubber impellers in floatation machines have far outworn those of wood or metal at several mills. Rubber riffles for concentration tables have been found better than wood at some of the big Missouri lead concentrators, and rubber launder linings are used in the Far East.

Outside of the mining field, we note that rubber paving for streets is being tried in Boston, a mixture of two-thirds old automobile tires and one-third new rubber being used, at a cost of about $15 a square yard. In London, rubber tennis courts are being tested. Pure rubber soles and heels for sporting shoes are a recent novelty that has been widely adopted.

In short, rubber at present prices, or possibly even at the old price, seems to be a material that deserves consideration wherever ability to withstand wear, rather than the quality of rigidity, is demanded. Other new uses will no doubt occur to many of our readers if they make a mental inventory of the machinery in their plants. And we believe the rubber companies will be found cordially receptive of any such ideas.

The Steers and Hogs Were Not Paid For

THE California State Corporation Department gives some interesting sidelights on the Kre-Ko Petroleum Co., of California, the promoters of which operated upon sundry farmers and others eager for riches. Some of the dramatic incidents of the comedy are as follows:

"Three deputy sheriffs became so enthused over the company's prospects as represented to them that they quit their jobs to become trustees of the company.

"A barbecue was held at which six steers and an equal number of hogs were the principal items, apart from the guests.

"The place where the feast was held was a beautiful, shady spot, said to be the land under which flowed the future wealth of prospective investors.

"Three busloads of prospects were taken to the barbecue from Los Angeles.

"A spellbinder was employed to tell all who attended how silly they were not to invest.

"Expensive offices were fitted up and the pretty wife of one of the trustee deputies was placed in charge.

"No sum, however small, was snubbed, and there was no sidestepping as to individuals. A blind man was induced to invest $10 from a meager hoard.

"Results of the investigation given to the district attorney showed that the three deputies had, through some manipulation of promoters, made themselves liable for debts of the company. They now are at work in oil fields in an effort to pay the bills. They are expected to be the chief witnesses against the promoters.

"The barbecue is said to have been held on land some distance from the leased oil ground. The steers and hogs for the feast still must be paid for, it is claimed. The expensive offices are closed and the pretty woman in charge carries an unpaid bill for $150 salary. The furnishings have been returned to the company from which they were purchased."

Short-circuiting Ben Franklin's maxims may lead to adventures of a certain kind, but we get ahead best by hard work intelligently applied. We have no special sympathy for the victims of these unscrupulous scamps that used the farmers' steers and hogs to befuddle the minds of other farmers, but we are glad to report that the promoters in question have been arrested and will get several days in court and probably a sojourn in jail.

Bunk for Morons

A CORRESPONDENT whose letter we print elsewhere relates that having a mining enterprise, and needing to raise capital, he prepared a prospectus which stated the plain and honest facts, and then waited for results. The result was zero. A friend commented, "The trouble is that you are an engineer, and not a promoter. You are too pernickity about sticking to facts. Get out and tell people what they want to hear. That is to say, tell 'em bunk. That will get you somewhere." And our correspondent concludes "The devil may take the whole outfit if nothing but bunk will save it, for we will have none of it."

We have noted recently, however, a certain strange tendency for engineers to come to the other decision—to use shyster methods and ballyhoo literature, and to employ slick promoters, in order to finance a mining enterprise the merit of which is by no means disproved. They have noted that these methods are efficacious, and failing to raise money by honest means, they feed the public what it clamors for. We cannot but condemn this practice as cheap, insincere, and dangerous; and applaud the determination of our correspondent quoted above. If you cannot mine honestly and stick to the facts in your promotion, quit mining, but retain your self-respect. Things have come to a pretty pass if mining engineers descend to the methods of race-track tipsters.

We would specify instances, some of which we have mentioned before. A case just called to our attention is the promotion literature of a certain chemical company, which is highly emotional, the lure being held up to the investor that $100 invested now may return $34,140 in dividends; yet our inquiries do not indicate that there is not an earnest enterprise back of it, the enterprise being to extract the salts from Searles Lake. Also, the other day we were amused at a circular letter containing the wildest sort of slush, misstatements, and psychologic appeal to ignorance and greed, offering stock in a mining enterprise in Mexico which many prominent engineers have believed to offer a fair gamble. "I feel," said the letter, "it to be the greatest opportunity to multiply dollars by as high as five hundred or even a thousand that has ever come to a human being in this day and age." "In other words, the deeper you go along the vein, the closer you get to the very source of the wealth." "The fact is that even though Three Hundred Million ($300,000,000) Dollars have been produced, the actual mine has only been scratched, and I believe that five thousand dollars put into this may make one a multimillionaire." While the literature emanated from a health specialist who had developed a side line of promoting, we were informed that he had undertaken to float the stock for a group of well-known engineers. We deplore this situation.

Let us face the facts. *The New York Herald Tribune*, in answer to a subscriber who recently asked its advice concerning buying Canario Copper, simply replied that 99 out of 100 of the mining stocks offered entailed total loss to the investor. It hopefully added, "This might be the one out of 100; it might also be one of the other 99." On the other hand, a so-called mining paper in the West, which is really run as an appanage of a brokerage office, recently editorially proposed that no mining promotions should be condemned by any broker, on the ground that it hurts business to do so, and creates a sentiment that reacts unfavorably on the individual profits of all brokers. To applaud all promotions is, plainly speaking, to extend the right hand of fellowship to many thieves. And it is not the bankers who have classified mining investments as dangerous, but the promoters themselves: they have established a condition impossible not to recognize.

There is plenty of money yet for mining investments and even for mining speculation, where the cards are not stacked. But the intelligent public is gun-shy; so that in their extremity some of the promoters of honest enterprises stoop to bamboozle the morons, and employ ignorant and insensitive persons to write and put out the literature that they have not the heart to write themselves.

What is the remedy? We see a chance for a new profession—that of engineer specialists in mining investments. Groups of mining engineers with a business sense and of assured probity might be formed to examine, approve with plain reservations, and offer for sale stock in meritorious ventures. Where the unknown individual finds success difficult along these lines, these groups of engineers could build up such a reputation that the stocks which they offered would be readily absorbed. Plain facts should accompany the offering, and the stockholder should be treated like a full-grown man. Mining would improve and the firms would eventually prosper. It would take, perhaps, a little time, to earn the reputation of being strictly honest, but that is the case in any business and industry. The earnings of these firms might be based on a substantial participation of the stock offered, by way of a fee.

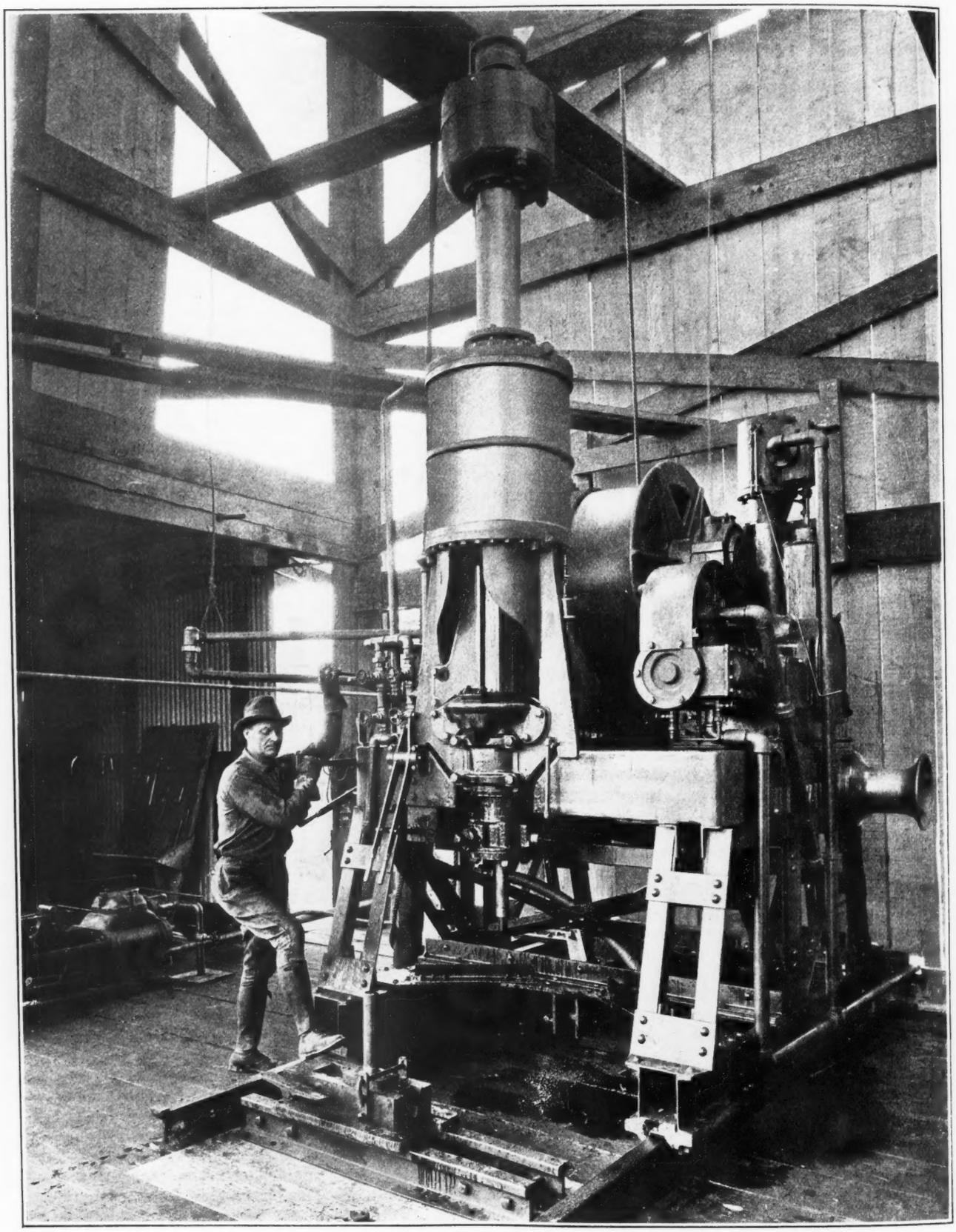
Dignity of the Mining Industry

THE REPUBLICAN CONVENTION at Cleveland included in its platform a plank which is of no significance except that it recognizes mining as an industry to be fostered. Great credit is due to Senator Oddie, of Nevada, for procuring the introduction of this plank, even in the position which it occupies, last except for the plank concerning the territories of Hawaii and of Alaska. It says:

"The mining industry has experienced a period of depression as the result of the abnormal economic conditions growing out of the war. This administration has accomplished much in improving the conditions affecting this great fundamental industry and pledges itself to continue its efforts in this direction."

This handsomely neutralizes a recent unfortunate circular which went out from the Treasury Department warning citizens against foolish investments, including those in mines. This circular was, of course, thoughtless and drafted by some minor official; while the platform plank is a well-considered expression of fact. Members of the "great fundamental industry" must interest themselves in seeing that the widespread appraisal of the nature of mining investments is changed for the better.

The King of Diamond Drills



When the diamond drill was introduced into oil-field work, experience soon showed the desirability of a larger, faster, and more powerful machine than existed, for handling heavy casings and deep wells. As a result, the drill shown was developed. It is designed to bore a 4-in. hole to 5,000 ft. and to set 4-in. casing at 4,000 ft. For petroleum work the diamond drill finds its greatest use in correlating formations in prospecting.

A Model Salt-mining Plant at Retsof, N. Y.

The Largest Installation of Its Kind in the World—Equipment Much the Same as That Used in Mining and Milling Metal and Other Non-metal Ores

By Arthur B. Parsons
Assistant Editor

COMMON SALT, in some form, is essential to human existence. Possibly it is reassuring, then, to know that if every other source were suddenly shut off the Retsof Mining Co., operating in Livingston County, N. Y., could supply every inhabitant of the United States with 2½ oz. of that necessary seasoner every day.

The company has just completed a model plant with a capacity for mining, hoisting, crushing, and sizing 3,000 tons of rock salt per eight-hour shift. The product, which comes from a horizontal bed ranging from 6 to 15 ft. in thickness, and lying more than 1,000 ft. beneath the surface, is not sold extensively for domestic use, but it averages 99 per cent sodium chloride and can be used for that purpose.

Salt Has Many Uses

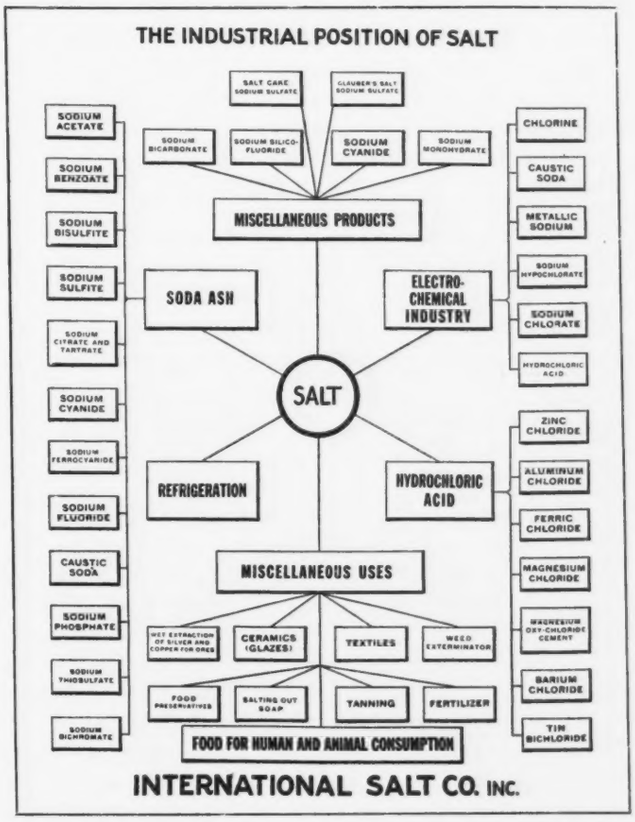
The principal uses of salt are shown on the accompanying diagram prepared by the International Salt Co., of which the Retsof company is a subsidiary. Some of the most familiar of these are among the most important from the standpoint of quantity consumed. In the summer, the ice-cream industry uses thousands of tons; and in the winter large quantities are used by railroad and street railway companies to keep their switches and tracks free from ice. Refrigeration of cars used for carrying fruit from California and other perishable food products, and preservation of meat in packing houses, both require large quantities of salt. The electro-chemical industries make use of rock salt as a source of chlorine, caustic soda and hydrochloric acid, and the various other industries shown on the diagram take their share. The Retsof company prepares five grades of products, depending on size, as follows:

Designation	Range of Particle Size, Inches	Per Cent Prepared
No. 2	7/16—5/16	12
No. 1	5/16—0.178	28
C.C.	0.178—0.096	28
F.C.	Less than 0.096	30
Cattle Salt	Large lumps	2

Salt has been mined in the Retsof district since about 1885, when the firm of Freeman & Barker sank what is now the original Retsof shaft. Reserves of ore for at least forty-five years at the present rate of production have been proved.

Six years ago T. Forster Courthope became general manager at Retsof. He operated the mine through the old shaft and got as good results as could be expected from the existing crushing and screening plant. However, with the end in view of attaining more economical production, it was decided in 1921 to sink a new shaft to be lined with concrete and to build a new crushing and screening plant. The site selected was about a mile from the old one. Mr. Courthope, assisted by his staff, determined the general scheme of the plant, and the firm of Allen & Garcia, as consulting engineers, was called in to co-operate in the designing of the structures and drawing of the plans, embodying in their layout special features such as the shaft bottom and skip equipment in which they have specialized.

The electrical equipment, which is an important feature, was designed and installed by the Scranton Electric Construction Co. and the surface buildings were constructed by the J. W. Cowper company. The sinking and concreting of the shaft was done by the Dravo Contracting Co. Work was started July 6, 1921, and the salt was struck on Aug. 16, 1922. A week later

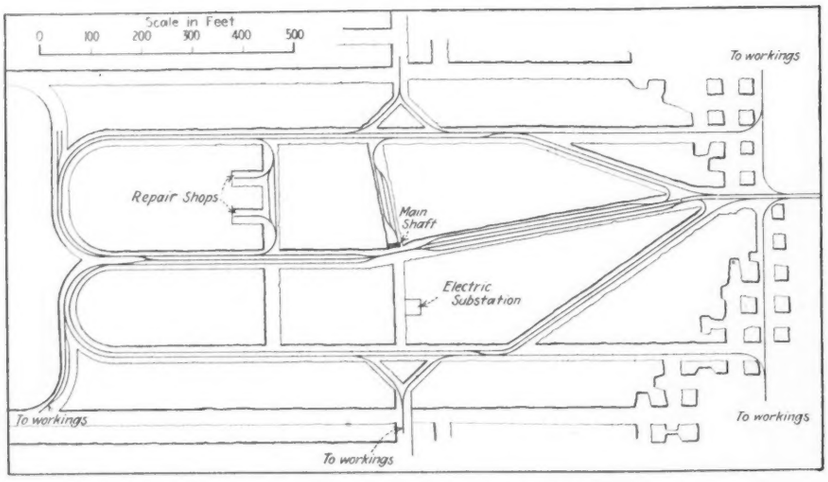


connection was made with the workings from the old shaft. Concrete work on the crushing and loading station at the shaft bottom was finished Dec. 15, 1922, and the entire plant went into operation early in 1924.

Salt Bed Lies Between Beds of Shale

The salt bed is virtually horizontal, and doubtless was formed by the evaporation of salt water in a "dead sea" of geological antiquity. Both the underlying and overlying strata are shale. No distinct line of cleavage separates the salt from the shale; both above and below there is a gradual merging of salt into shale, suggesting an interesting geologic episode when salt was precipitated for a time between two eras of mud deposition. The mine, of course, is entirely dry.

The shale is tough and strong and no timbering is required to support the "roof" of the rooms, which are 30 ft. wide. The thickness of the minable ore, between the horizons where the shale below and above begins to contaminate the salt, varies from 6 to 15 ft. Where it is thicker, a 7 ft. lower layer is mined and the remainder is "slabbed" from the roof. The crystals of



Details of the layout of the shaft bottom

salt are rather tough, but are not hard, and electric auger drills have been found to give the best results and are used exclusively. The augers of crucible steel are made with eight twists to the foot and drill a hole 1½ in. in diameter. A day's drilling ranges from 225 to 300 ft., the average depth of holes being 7 ft. A round of holes (6 vertical lines of 4) in a 30-ft. head breaks 2½ ft. The two middle lines of holes make a blunt wedge, and the others, paralleling them, break toward the center.

Blasting is done by a special crew using 20 per cent ammonia powder and electric detonators. The deposit is so uniform that no effort is made to locate pillars in thin parts of the bed, the layout of galleries and haulageways being much like that followed in mining coal. The accompanying sketch shows the openings in the vicinity of the new shaft.

Myers-Whaley Loaders Work Well

Loading is an important phase of the work, and about 75 per cent is done with Myers-Whaley electrically driven loaders, each machine handling from thirty to thirty-five tons of material per hour. Experience has shown that they must be kept in good repair if they are to operate efficiently, and for that reason spare machines are provided, the total number being thirteen.

Electric current for operating the loading machines as well as the locomotives and the other underground equipment is brought down the shaft at 2,300 volts in a fibre conduit buried in the concrete wall. Transformers and a substation containing a rotary converter are situated near the bottom of the shaft.

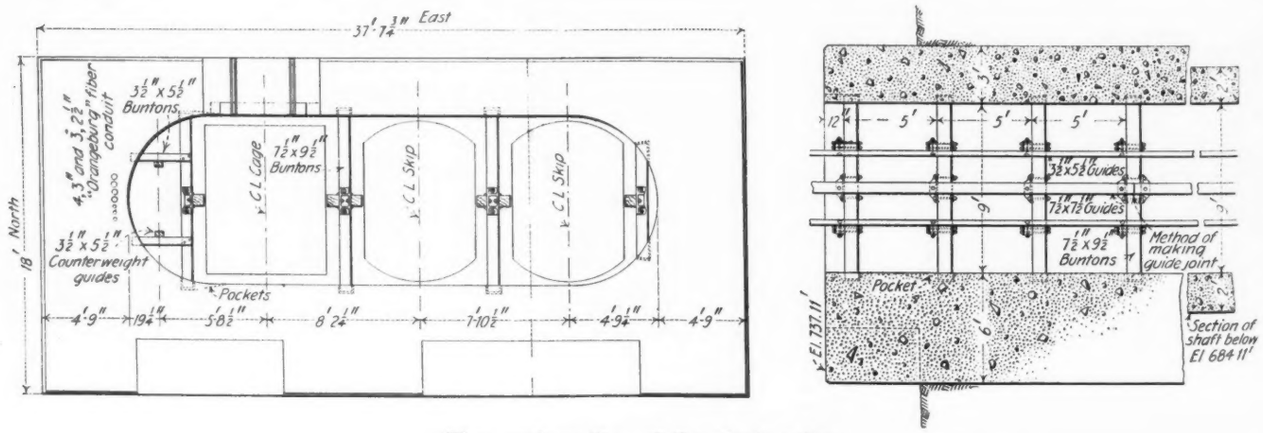
Cars of three-ton capacity, with a wooden body similar to those in the anthracite coal region of Pennsylvania, are used, but the company has under consideration the introduction of steel cars in the expectation of reducing the cost of upkeep. The tracks throughout the mine are of 36-in. gage, with 40-lb. rails. The roadbed is kept in good condition and the rail bonds are electrically welded. Mules are used to collect the cars from the working face, and six-ton General Electric locomotives, equipped with trollies, haul sixteen-car trains from the collecting points to the main hoisting shaft. The equipment includes 482 mine cars, and, as is indicated on the sketch, trackage is provided for 250 loaded cars in approaches to the foot of the shaft.

There is no storage bin, but the provision for loaded cars is a substitute. This absence of any other storage space, either underground or in the surface plant, until the material has been crushed to $\frac{7}{16}$-in. size, is explained by the fact that if the salt remains in a bin for any length of time it tends to absorb moisture and to solidify to such an extent that it has to be "dug" all over again.

A rotary dumper handling one car at a time empties a train of sixteen in four minutes without uncoupling the cars from each other. It is supplied by the Car Dumper & Equipment Co. and is operated by compressed air. The automatic "car feeder" that advances the train in its progress through the dumper is electrically operated.

The salt slides down an inclined bar screen through which pieces under 4 in. pass directly to the skip-storage hoppers. The oversize passes through a 30x42-in. all-steel Buchanan jaw crusher set with a maximum opening of 6 in. The crushed product, joining the undersize, is automatically split between the two hoppers that fill the balanced nine-ton skips of the main hoisting plant. The general arrangement is shown in the accompanying sketch.

This entire installation at the bottom of the shaft is characterized by careful and rugged design and permanent construction. The object is uninterrupted,



Plan and section of the shaft collar

MINING ROCK SALT

at Retsof, N.Y.

1

A train of sixteen cars is emptied in four minutes by means of this rotary dumper.

2

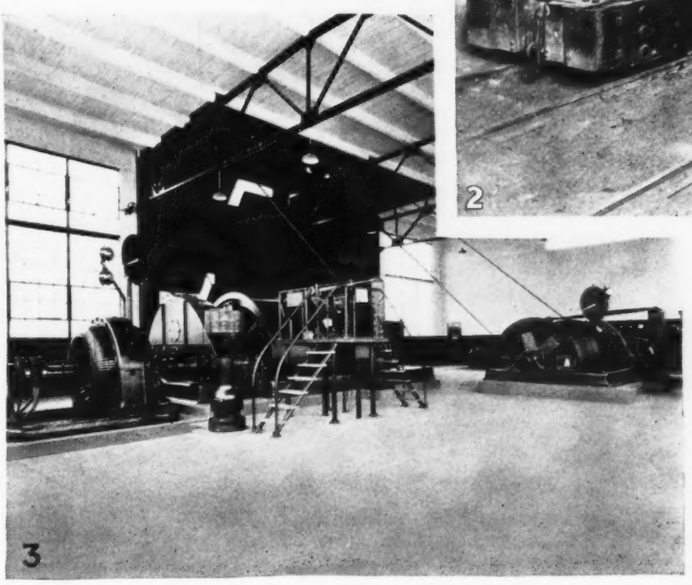
Trolley locomotives operate on a 36-in. track of 40-lb. rails.

3

Automatic safety devices make accident with these hoists virtually impossible.

4

The new brick office building at the mine is complete in every way.



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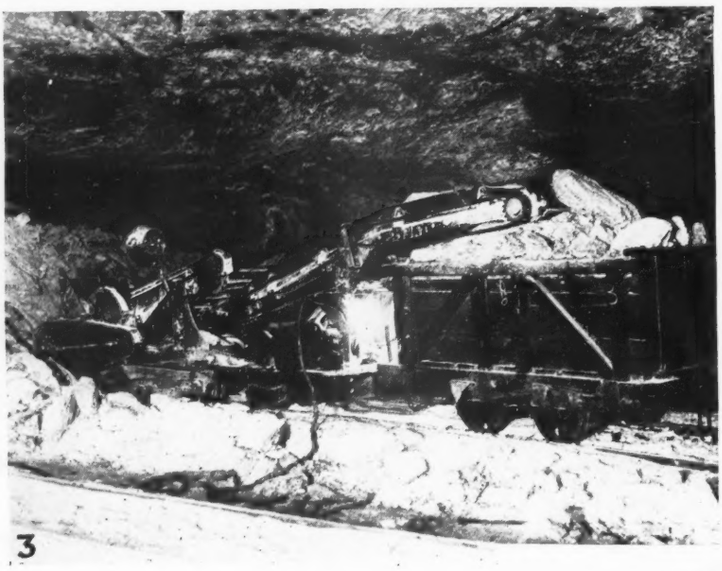
2



3

1

The rotary dumper in operation. Note the absence of timber to support the "roof."

2

Electrically operated auger drills are used exclusively.

3

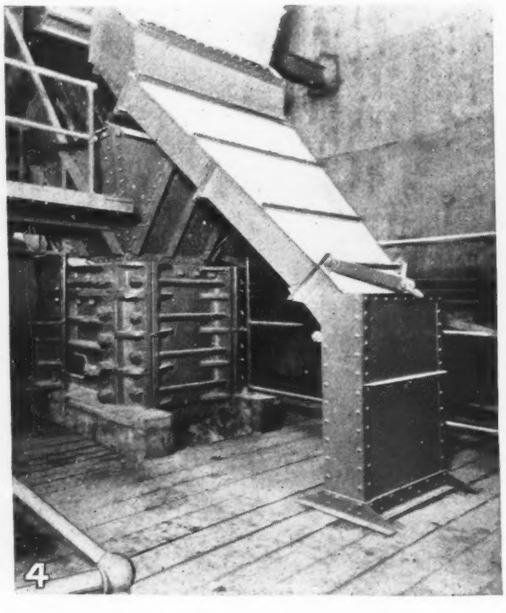
Three fourths of the salt is handled by Myers-Whaley electric loaders.

4

Steel chutes and hoppers and concrete walls feature this roomy underground crushing plant.

5

The underground substation supplies direct current for operating loading machines and locomotives.



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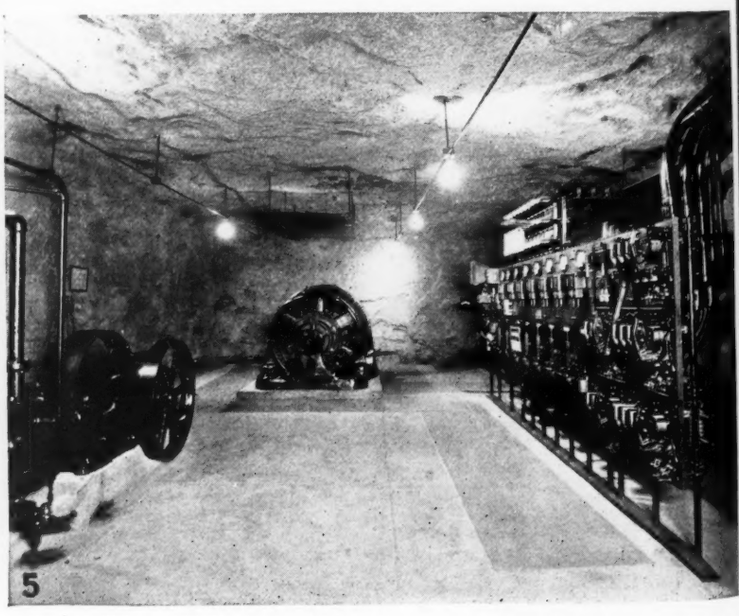

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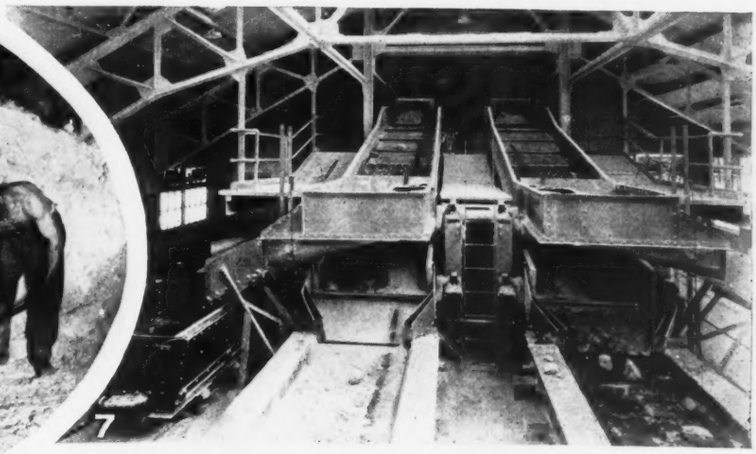
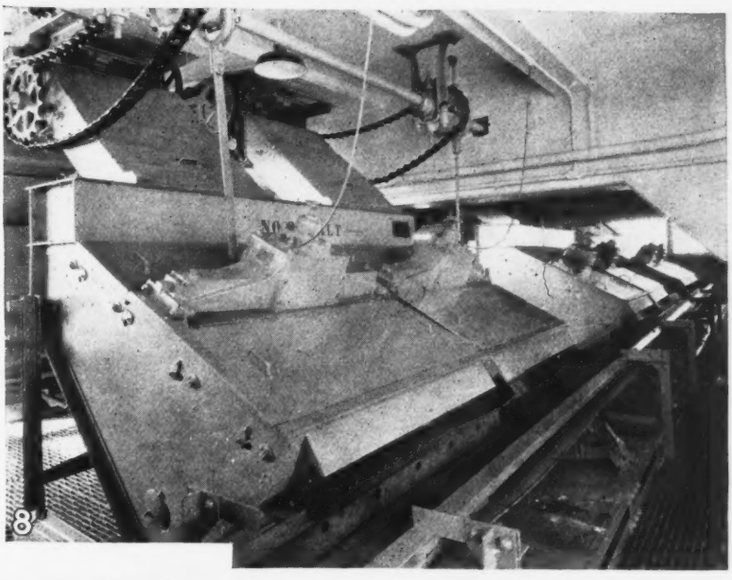




6

The granular character of the "ore" makes shoveling comparatively easy.

7

Primary shaking screens at the top of the crushing and screening plant.

8

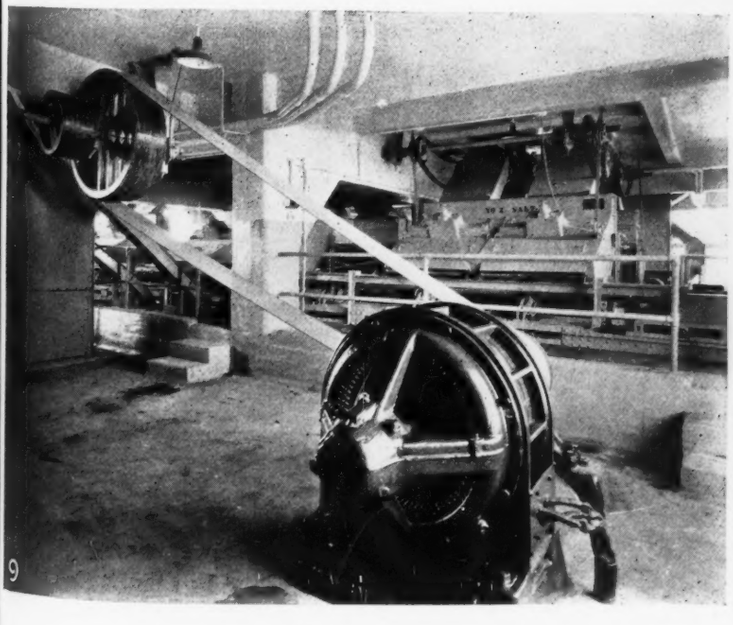
Hummer screens discharge onto conveyor belts. Note the "subway" grating for floors.

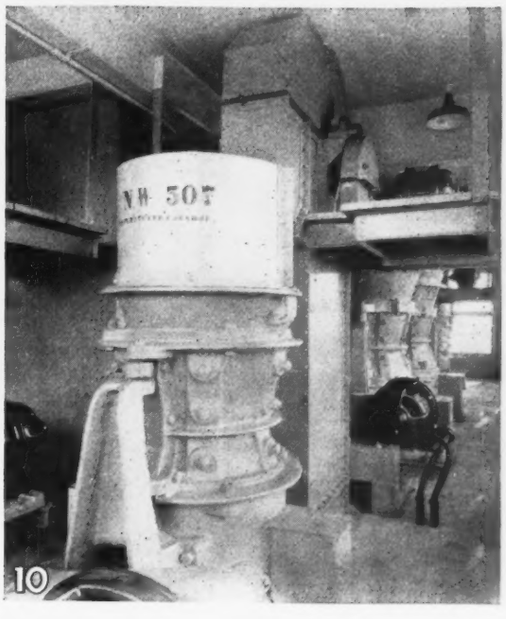
9

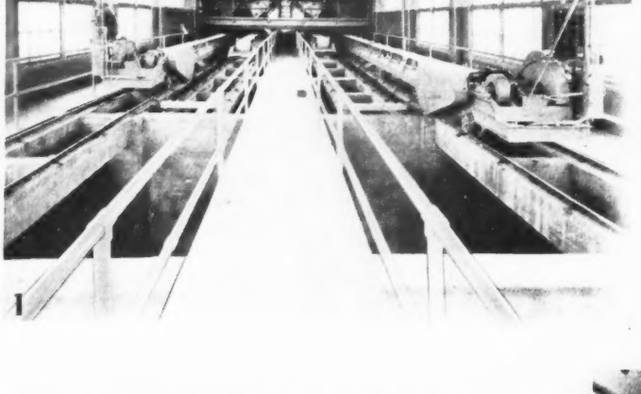
Another view of the screening floor.

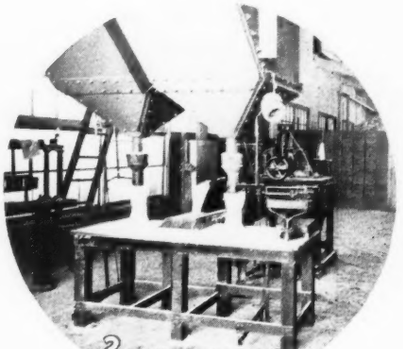
10

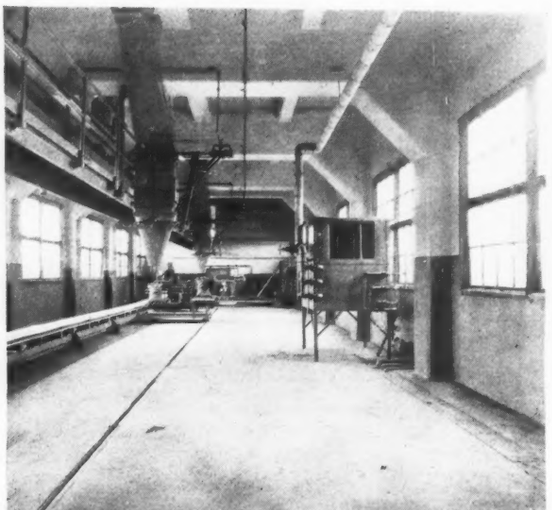
Sturtevant crushers are driven by individual electric motors.











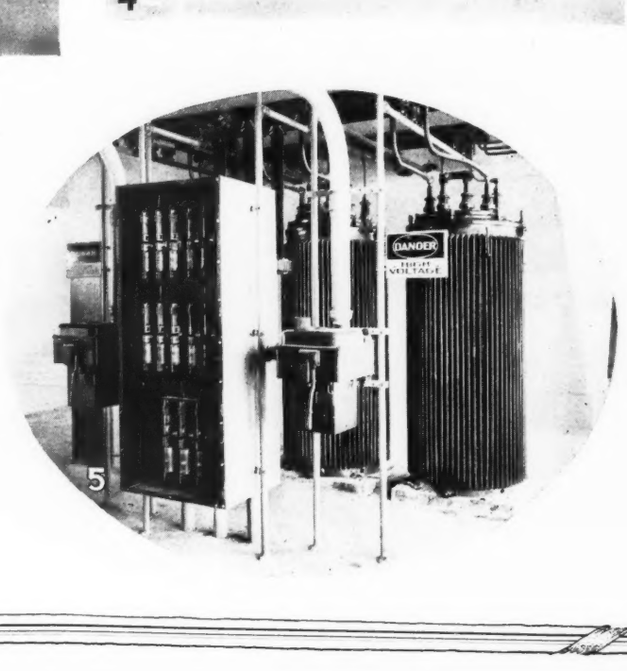
1
Shuttle conveyors make it possible to fill any storage bin without the use of trippers.

2
Arrangement is made for filling 2-lb. bags ready for the housewife who makes her own ice cream.

3
Chutes for filling bags with finished salt.

4
Box cars are loaded with bulk salt by means of conveyors and the contrivance shown here.

5
Electrical equipment is the best. Note the dust-proof steel switch-box.



rapid, safe operation, with the minimum of replacement and repair. Only steel and concrete are used.

From the excavation 3,531 cu.yd. of rock was removed and forty-four tons of reinforcing steel was used in the concrete. Girders, chutes, stairways, and floor are of steel. The equipment is largely automatic and interlocked by electric and mechanical devices. The car-dumper cannot operate when the loading hoppers are full; and the lowering and raising of the skip automatically opens and closes the discharge gate from the hopper.

From the surface to the bottom of the shaft is 1,150 ft., 77 ft. of this being for the crushing and loading station. The concrete walls at the bottom of the shaft, and for 40 ft. below the collar, average about 4 ft. thick and are reinforced with steel. The intermediate section has no reinforcement and the walls are from 12 to 24 in. thick, the variation resulting from the irregularities of breaking when the shaft was being sunk. The concrete, mixed 1—2—4, was poured in 60-ft. sections. Tapering hitches were left in the walls for 7½x9½-in. timber buntons. The guides of long-leaf pine are secured to the buntons by special cast-iron brackets. The sketch of the shaft shows the principal features.

Headframe Set on Concrete Shaft

The vertical members of the steel headframe, as can be seen in the accompanying illustrations, rest on a reinforced concrete elevator-like inclosure, 80 ft. high, which forms an integral part of the main mill structure. The steel back stays go to the ground. This design, though unusual, seems to combine strength with economy of steel. The four 10-ft. Medart sheaves are fitted with interchangeable steel treads.

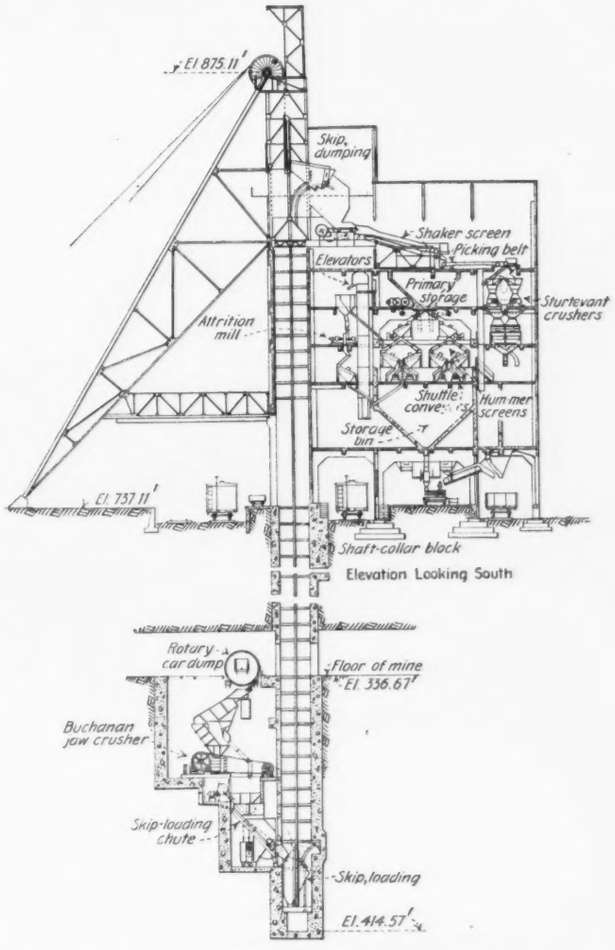
The hoisting installation is modern in every way. The machines and the auxiliary equipment are housed in a commodious, well-lighted brick and steel building. Both the skip hoist and the cage or service hoist are electrically operated. They are supplied by the Ottumwa Iron Works. The skips operate in balance, whereas a 10,500-lb. counterweight is used against the service cage. Both hoists are provided with complete automatic equipment for obviating accident. The operation of the safety devices is independent of the will of the operator. The following table gives the operating conditions for which the main hoist is designed:

Weight of skip, lb.	15,000	Acceleration, sec.	10
Weight of salt, lb.	19,000	Full speed, sec.	45
Total skip travel, ft.	1,253	Retardation, sec.	10
Size of rope, in.	1¼	Distance between sheaves, ft	8
Capacity per seven hrs., tons	3,000	Motor hp.	1,050
Rest period, sec.	10	Current, alternating, volts.	2,200

The drums of this hoist are cylindro-conical, 8 ft. in diameter at the small end and 12 ft. on the cylindrical portion. The machine weighs ninety tons. It is connected to the 1,050-hp. General Electric motor through a single-reduction herringbone gear.

The crushing and screening plant is called a "breaker," probably because most of the engineers who have been connected with mining rock salt are from the coal-mining districts. "Mill" would be a more descriptive term for the metal-mine operator. The design and construction have unusual features; experience in the old plant indicated certain difficulties arising from the unique properties of the "ore," and effort was directed at overcoming them. When salt gets damp brine is formed, and brine attacks copper, brass, and iron. For this reason great care is taken to protect the electrical equipment. Switches, fuses, and starting devices are inclosed wherever possible, and push-button controls are provided.

Exposed surfaces of concrete and iron, both inside and outside the plant, are given several coats of paint. The inside of bins and the floors are given four applications of Lapidolith waterproof paint, followed by two coats of gray navy-deck paint. It is believed that unless the concrete surface is waterproofed, brine gradually will penetrate to the reinforcing iron, attack it, and thereby weaken the structure, eventually. The painting is done with especial care. Aside from utility it certainly adds to the appearance of things.



Section showing general arrangement of the plant

Steel and reinforced concrete are used throughout, both underground and in the crushing and screening plant.

I visited the plant just prior to the time it started, and I can say without hesitation that I have never seen, around a mine, any that excels it in the ship-shapeness of erection, installation, and finishing, both inside and out. The structure is as nearly fireproof as can be, steel and reinforced concrete being used throughout. The bins are concrete, and launders, chutes, and elevator housings are of sheet steel. The roofs are tiled and the walls of the upper part of the hoist structure are covered with Johns-Manville asbestos board.

The scheme of treatment is shown in the accompanying flow sheet. The market demand for F. C. salt (finer than 0.096 in.) normally is not sufficient to absorb all that is produced in the course of milling. Accordingly the object usually is to crush and grind so as to get the maximum of the coarser sizes and a mini-

mum of fines. Provision is made, however, for regrinding No. 1 if that should at any time become desirable. The principal machines used for crushing are Sturtevant fine crushers—four of the No. 2 size, which take 6-in. feed and reduce to 1¼-in., and four of 1½ size, which crush to 1 in. Two Stephens-Adamson 18x20-in. smooth roll crushers are provided to crush oversize from the first sets of vibrating screens; and two Bauer attrition mills are available to grind No. 1 salt to F. C. size.

Slate Removed by Picking and Screening

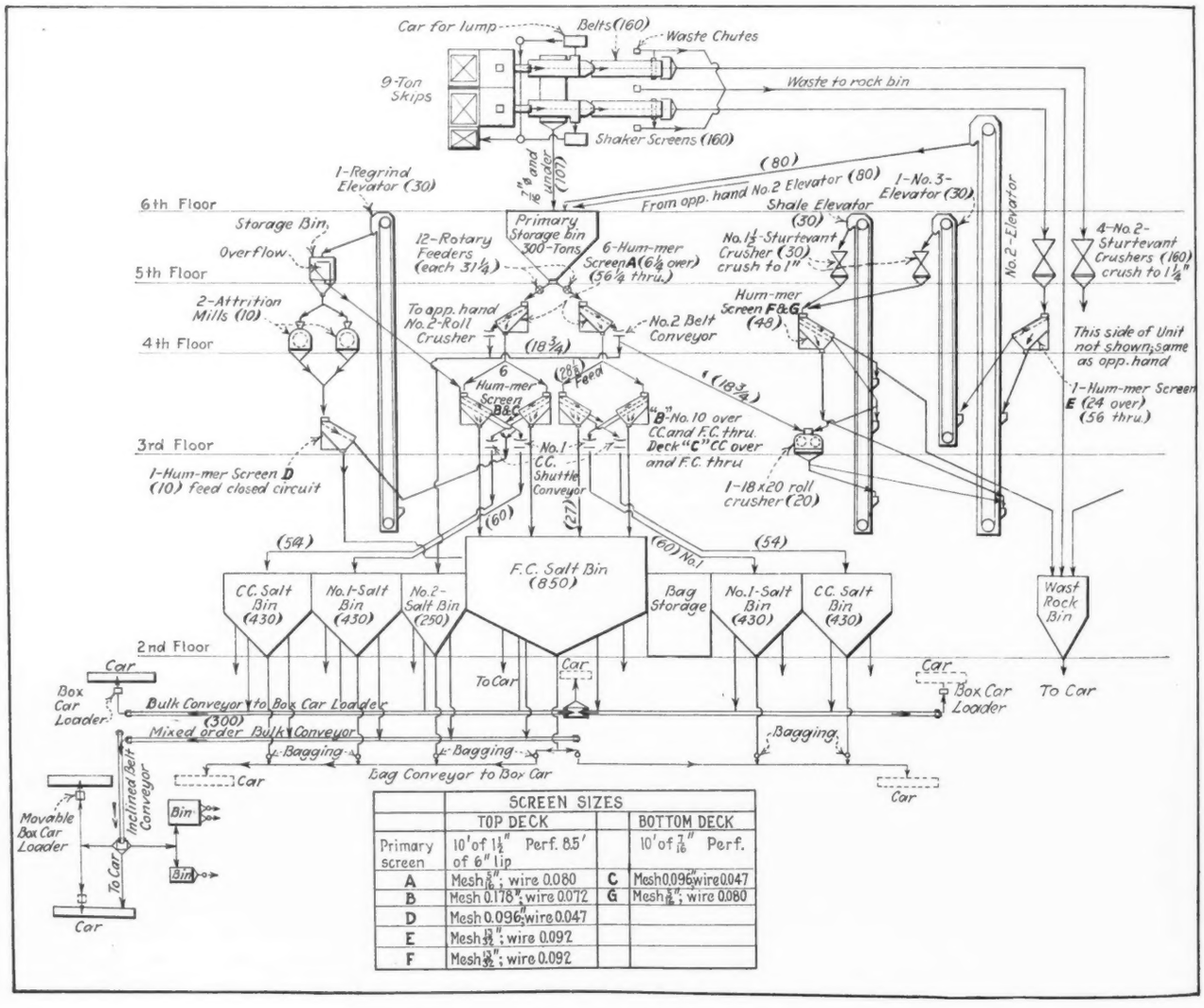
As the run-of-mine ore is dumped from the skips it is fed by a reciprocating pan feeder to a shaking punched-plate screen, the products of which are (a) through 7/16 in. product, (b) oversize for crushing, and (c) large chunks which are removed and sold as cattle salt. The oversize passes to a 48-in. rubber picking belt, where six or eight men sort by hand and discard the small proportion of slate that contaminates the salt. A magnetic pulley also removés tramp iron.

The friability of the salt is taken advantage of to remove slate that eludes the pickers. As indicated in the flow sheet, this is accomplished simply by discarding an oversize product obtained on two Hum-mer screens inserted in the Sturtevant-mill crushing circuit. The salt crystals pass through the screen, and the "flakey" slate is readily separated. As the ore is not dirty, the contamination of the product by slate is not serious.

The outstanding feature of the new treatment as compared with that in the old plant is the use of Hummer screens. I am informed that the largest single shipment of these screens ever made was required to fill the order for this installation. In all there are twenty-four double-deck and twelve single-deck screens. Square-mesh double-crimped Tyler wire cloth is used. Several Hum-mers were tried in the old mill as substitutes for the ordinary shaking screens. The increased efficiency and capacity clearly demonstrated the economy of installing them in the new plant. Each 8-ft. machine has a capacity of fifteen tons per hour, and the sizing is cleaner than with the other equipment.

Efficient Handling Prime Object

Handling the material is an important factor in efficient operation; the elevators, conveyors, and chutes are well designed. Buckets and chains for the elevators were supplied by the Link Belt Co.; the housing,



SCREEN SIZES			
	TOP DECK		BOTTOM DECK
Primary screen	10' of 1½" Perf. 8.5' of 6" lip		10' of 7/16" Perf.
A	Mesh 5/16"; wire 0.080	C	Mesh 0.096"; wire 0.047
B	Mesh 0.178"; wire 0.072	G	Mesh 5/16"; wire 0.080
D	Mesh 0.096"; wire 0.047		
E	Mesh 13/32"; wire 0.092		
F	Mesh 13/32"; wire 0.092		

Flow sheet of the crushing and screening plant

A portion of the equipment is not shown, as it merely duplicates that illustrated. The figures in parentheses indicate rated tonnages.

made of ⅛ sheet steel fitted so as to be dust-tight, was made by the Stearns Conveyor Co., and A. Lucas & Sons furnished the reciprocating screens and the steel chutes that carry the various products.

Rotary feeders actuated by Link Belt silent-chain drives supply a uniform feed to the screens from the 300-ton primary storage bin. These feeders consist of a small drum provided with four longitudinal blades, at 90 deg. with each other, working at the bottom of an inclined chute with a curved lip.

The distribution of finished products to the proper storage bins is accomplished by means of four long shuttle conveyors mounted on steel frames that travel on tracks above the bins. These are shown in the accompanying illustration. The motor and controller for operating the conveyor belt, as well as the shuttle itself, are mounted on the carriage, the power being obtained through a flexible cable suspended on a galvanized iron track-wire.

Conveyor belts likewise play an important part in the loading of the salt into railroad cars for shipment to consumers. For loading in bulk the salt is fed from the appropriate storage bin onto an overhead belt conveyor which carries it to one of two Manierre box-car loaders situated at either end of the plant. One is shown in the accompanying illustration. Sacks of salt weighing from 150 to 200 lb. are carried by means of a conveyor belt running on flat instead of troughed pulleys, with slide slats between to prevent sagging.

The cost of sacking has been greatly lessened by improved methods; a machine has been developed at Retsof, mounted on rails, which facilitates filling, sewing, and disposing of sacks with a minimum of manual labor. The feature is a patented stand which supports a sack while it is being loaded and automatically drops it onto the cross conveyor that runs continuously beneath. The cross belt delivers the sacks to a conveyor, which in turn delivers to a mounted conveyor that enters the car. Marked improvements have also been made in the air-operated measuring and filling machine. This department of the plant is one in which a large saving of labor will be effected. The total surface force required is about half that needed to operate the old plant at the same capacity.

The average mining engineer might wonder whether the undoubtedly large expenditure involved in this project is warranted. He might think that a less substantial or at least less expensive structure would serve the purpose equally well. The answer probably lies in the fact that the plant as built will doubtless serve its purpose for several decades at least. The ore developed and minable through the new shaft is sufficient to last for not less than forty-five years, and no radical change is likely to be made in the scheme of treatment. In this particular the operation is unlike most processes of modern ore dressing, in which vital changes are frequently made necessary by improvement in the art. It is true that some one may devise a better crusher or a better screen than the ones now used, but if a change were to be made rebuilding would not be necessary.

The Retsof company has aimed to build a plant that requires the minimum expenditure for upkeep expense; that can be operated at high efficiency; and that will produce salt in marketable form for many years at a minimum cost. In designing the plant some consideration was given to obtaining a group of buildings that was pleasing in general appearance, though without sacrificing utility in any degree. The company has made no effort to disguise the industrial purpose of the plant; and yet there is a certain architectural quality that makes it anything but a blot on the landscape of the beautiful Genesee Valley.

A Mining Town on the Mother Lode

Sutter Creek, an old gold camp of California

Rod Mills Not an Insurance Against Unnecessary Sliming*

By Will H. Coghill and C. O. Anderson
Metallurgist and Assistant Metallurgist, Bureau of Mines

OFTEN the claim has been made that rod mills do not slime so much as ball mills. Perhaps they do not, but the statement does not imply that the use of rod mills will relieve operators of all anxiety about sliming. In the following instance there was excessive grinding both of the gangue and of the sulphides. The ore was a complex sulphide of blende, galena, and silver mineral. The gangue was altered granites and porphyry. The screen analysis of the feed to the rod mill is shown in Table I. The complete Tyler screen scale (except the 28 mesh) was used.

Table I—Feed to the Rod Mill

Product Size, Mesh	Per Cent Weight	Assay Per Cent Zinc	Per Cent of the Zinc	Assay Per Cent Lead	Per Cent of the Lead	Assay Oz. Silver	Per Cent of the Silver
Plus 3	36.90	1.84	21.40	1.00	20.35	1.66	24.10
— 3 + 4	13.15	3.04	12.59	1.88	13.63	3.00	15.51
— 4 + 6	6.32	3.60	7.16	1.85	6.45	2.74	6.81
— 6 + 8	6.20	3.33	6.50	1.86	6.34	2.24	5.46
— 8 + 10	5.38	3.37	5.71	2.47	7.32	2.80	5.92
— 10 + 14	3.43	3.79	4.09	2.82	5.32	2.87	3.90
— 14 + 20	3.78	4.02	4.78	3.10	6.45	2.50	3.71
— 20 + 35	4.82	5.75	8.73	3.50	9.28	3.35	6.34
— 35 + 48	2.26	6.63	4.72	3.00	3.73	3.20	2.84
— 48 + 65	1.86	5.75	3.36	2.55	2.61	3.00	2.20
— 65 + 100	2.25	5.40	3.85	2.10	2.60	2.60	2.31
—100 + 150	2.41	5.50	4.17	1.80	2.38	2.70	2.55
—150 + 200	0.96	5.75	1.74	1.43	0.74	2.52	0.95
—200 + 260	1.16	6.20	2.26	2.50	1.59	3.80	1.72
—260 + 325	0.72	4.40	1.00	2.00	0.78	4.10	1.15
—325	8.40	3.00	7.94	2.25	10.43	4.40	14.53
Composite feed to rod mill	100.00	3.17	100.00	1.82	100.00	2.54	100.00

That it is unnecessary to crush a great deal of the gangue was proved by jigging the plus-14-mesh material. Laboratory jigging showed that if the mill feed had been broken to one-half inch and jigged, two-thirds of it could have been discarded as a tailing of lower tenor than the current mill tailing. Only a small home-made "smittem" jig would have been required to perform this preliminary concentration. The mineral product made by the jig would have needed grinding to 14 mesh (about 1½ mm. round hole) to unlock the sulphides from the gangue and from one another. This could have been performed best with rolls.

The bit of mill practice described happens to be in a district that for many years has borne the reputation of having ores just a little too lean for profitable milling. Hence the importance of coarse crushing, and preliminary concentration on a jig, becomes obvious, and should be practiced whenever possible. For instance, in the above mentioned case, by means of this initial concentration in the coarse state, the tonnage for final treatment would have been reduced to about one-third of the original, and the tenor in lead, zinc, and silver would have been increased about threefold. Thus, by a simple treatment, an enriched feed, sufficiently attractive from a business standpoint, would have been obtained for final concentration.

Metallurgists must give more attention to the concentration or milling of the gangue, and not so much to the usual procedure of crushing the entire mill feed to the size where the last grain of sulphide mineral is liberated. An axiomatic truth in successful and economic milling of ores, but one often forgotten, is that concentration of the gangue is as important as the concentration of the mineral. If possible, elimination of the gangue should begin as soon as a goodly part of it has been liberated, instead of waiting until 100 per cent of the mineral has been freed. Distinction must be made between liberation of the gangue and liberation of the mineral. They go hand-in-hand and yet they present widely divergent viewpoints in considerations of milling.

The excessive grinding of the sulphides is brought out by Table II, which is a screen analysis of the discharge of the rod mill. The nature of the minus-325-mesh material only will be cited, but other deductions could be made also. In the feed to the rod mill, 10.43 per cent of the lead was present in the material passing through 325 mesh, and in the discharge from the rod mill, the proportion of the lead in this size of material was 43.27 per cent. Thus, (43.27 — 10.43) 32.84 per cent of the lead was made finer than 325 mesh by the pass through the rod mill.

Table II—Discharge of the Rod Mill

Product Size, Mesh	Per Cent Weight	Assay Per Cent Zinc	Per Cent of the Zinc	Assay Per Cent Lead	Per Cent of the Lead	Assay Oz. Silver	Per Cent of the Silver
Plus 20	0.88	1.49	0.46	0.44	0.25	1.52	0.57
— 20 + 35	8.86	1.85	5.69	0.52	2.92	1.26	4.74
— 35 + 48	10.60	2.47	9.09	0.78	5.10	1.44	6.44
— 48 + 65	11.13	2.73	10.54	0.98	6.90	1.60	7.56
— 65 + 100	12.64	3.24	14.20	1.55	12.33	1.94	10.41
—100 + 150	11.24	3.40	13.26	1.91	13.58	2.22	10.59
—150 + 200	3.89	3.29	4.44	1.32	3.25	1.74	2.88
—200 + 260	5.62	3.60	7.02	2.34	8.26	2.50	5.97
—260 + 325	3.22	3.55	3.97	2.03	4.14	2.46	3.37
—325	31.92	2.83	31.33	2.14	43.27	3.50	47.47
Composite discharge of rod mill..	100.00	2.88	100.00	1.58	100.00	2.35	100.00

The effect on the silver minerals is just as severe; 32.94 per cent of the silver was slimed in the rod mill to 325 mesh. Such work might be tolerated if zinc were not present, but in a district where zinc is often a liability rather than an asset, grinding to a size amenable to gravity concentration instead of sliming must be emphasized. In the work described above, 15.5 per cent of the recovered lead is lost in the zinc concentrate, 23.5 per cent of the recovered zinc is lost in the lead concentrate, and 34 per cent of the recovered silver is in the zinc concentrate. Excessive grinding contributed to the result that 43 per cent of the silver was lost in the mill tailing.

Surely the use of the rod mill to slime one-third of the lead and silver to 325 mesh is undesirable when unlocking of the ore was complete at 14 mesh. It is indeed bad practice to have a mixed sulphide feed so slimed by a rod mill that 43 per cent of the lead and 47 per cent of the silver is finer that 325 mesh before concentration begins; especially is such a condition undesirable when it is remembered that separation of sulphides either by tables or by flotation becomes increasingly difficult with increasing fineness. It is safe to conclude that even rod mills should be used with discretion on mixed or complex sulphide ores, especially when blende is present.

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Milking Millions From the Mill; or Strong for Philanthropy

OUT OF A MESS of promotion literature, we have selected for honorable mention the following circular, which we reprint without commentary. We have italicized only certain portions. On account of lack of space, we have been obliged to edit out certain paragraphs.—Editor.

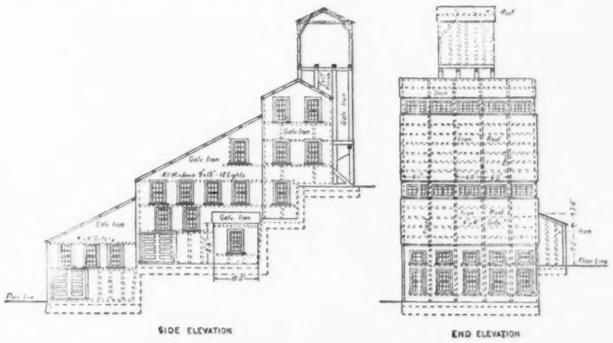
"My dear Friend and Pupil:

"You probably have heard how some time ago, *I cleared over three hundred thousand dollars in a mine* on an investment of less than twenty thousand dollars. I did this through the co-operation of a mining man who is an expert in mining.

"Many of my pupils, after being benefited by my instructions, have asked me if I could not also help them in matters of making money—increasing their wealth, and I have done this to a very great extent, for the reason that one in my position naturally has a great number of wonderful opportunities offered to him. Moreover, I seem to have a 'money sense' through which I am enabled to see the advantages of a proposition. There is, no doubt, such a thing as 'money sense.'

"Naturally, I want to give my pupils the benefit of my 'money sense' so that those who do not have it themselves may profit through mine. Other men have had ambitions to build libraries and sanitariums and hospitals, and to do constructive work in various ways. My idea is altogether different. I want to increase the personal wealth and happiness of my pupils so they may enjoy life better. It is my ambition to make as many of my pupils as possible rich through my 'money sense.'

"Some time ago, a man in Colorado obtained leases on ten thousand acres of oil territory. He offered to give me and my pupils 25 per cent of these leases if we would put down the first well. I wrote to my pupils about it, stating that this would require about fifty thousand dollars. My



pupils however, almost immediately sent me eighty-nine thousand dollars for this proposition.

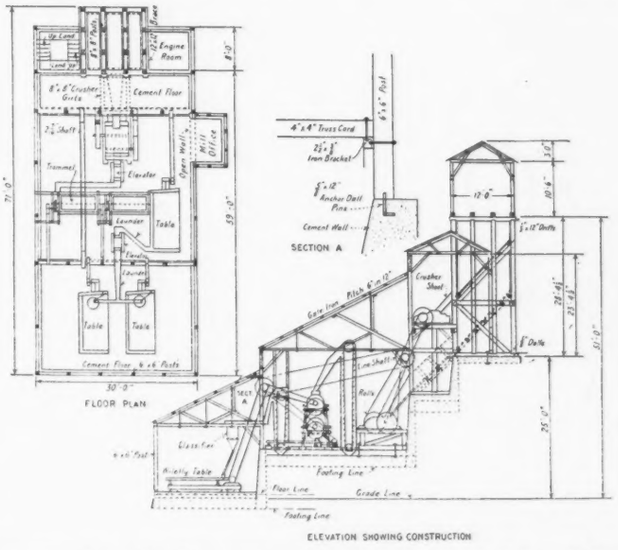
"I personally visited the territory and had two of the best geologists in Colorado pass upon the proposition. *Both stated that it was good oil territory, but I knew from my own knowledge of geology, that the probability of vast pools of oil existing on these leases was very meager,* and in this, the geologists agreed with me. I therefore rejected the proposition and returned every penny of this eighty-nine thousand dollars to my pupils, not deducting even one cent for my personal and geologists' expenses.

"The above illustrates the way in which I handle my pupils' money—I am as eager to have my pupils to multiply their dollars as I can be.

"Soon thereafter, a mine, having a vast body of milling ore, was offered to me for my pupils. This proposition required sixty-two thousand five hundred dollars, for the equipment and erection of a mill. This sixty-two thousand, five hundred dollars, was sent to me by a few of my pupils in a few days after having been notified of the proposition. The mill is in course of construction, and the ore reserves are being increased, so that the showing at the present time is that each one of my pupils who invested in this proposition, will receive not less than ten dollars for every dollar invested. *The probabilities are that my pupils will be paid ultimately twenty-five dollars for every dollar invested.*

"Today, through this same *mining man, through whom I made three hundred thousand dollars,* I have an opportunity that is greater than any I have ever seen.

"Have you ever heard of ten mines in one—a whole mining camp in one mine. This is precisely what is in our



grasp through the successful negotiation of this *mining man through whom I made three hundred thousand dollars.*

"I personally visited and went over this mining camp, and have seen the ore, and it is wonderful—marvelous. Fortunately for us, the mines are about twenty miles from a railroad and this means that only the highest grade ore can be shipped at a profit. Furthermore, and fortunately for us, the ore in these ten mines is just below shipping grade, and therefore, this makes an opportunity for a mill. This is our chance. A mill manufactures medium and low-grade ores into rich ore—into a high-grade product. It takes from six to eight or ten tons of medium-grade ore, and makes one ton of high-grade ore of them. This high-grade or rich product is then shipped at a great profit.

"Moreover, *my mining man, through whom I made three hundred thousand dollars,* has agreed to take charge of this matter and to receive no salary, but is to receive all his pay in stock and not in cash. Just think of it—ten different ore bodies of our own, ready to be converted by our mill into rich ore and into cash.

"This is not all. *My mining man reports that there is an ore on this property which is used in certain radio sets, and for which he has received an inquiry, at a dollar per pound. My mining man reports that it is his opinion that a million pounds of this ore probably exists in these mines. This is a mere extra resource.*

"This however, is not the greatest resource, nor is this all. The following is even more startling and sensational. *Our next door neighbor, in his mine, produced eight million dollars in gold,* most of which was taken out of a flat bed at a great depth. My mining man has examined this property and found that this flat bed underlies our mines at a depth of about six hundred feet. There is every reason to believe that *this will produce as much, if not more, in our ground, as it did in our neighbor's ground,* because we have a much larger territory from which to draw.

"Furthermore, in taking out the medium-grade ore for the mill, a great amount of rich and shipping ore will also be taken out. This will mean an extra profit. No one can tell what we will make, because the conditions are sensational. *It looks to me like millions and millions of dollars. However, these are but the extras.*

"I have written to some of my pupils about this, and I have already collected from them more than thirty-five thousand dollars for this mill. This mill will require in the neighborhood of fifty thousand dollars. I do not want any one of my pupils to put in more than five thousand dollars. The possibilities are so enormous that *I believe that two thousand dollars put into this mill, will actually bring you riches for life.* We will receive first, our money back, and second, we will receive four shares of stock absolutely free for every dollar that we advance to this mine for the mill. In other words, we will receive four shares of stock for every dollar that we let this mine use for putting up the mill. This stock will be given to us as a bonus. There is enough ore now exposed in the mine and available for the mill to pay back the mill fund many times. You can see that there is nothing but riches and success and prosperity ahead of us in this matter.

"Think of the happiness of being supplied with cash by a rich mine—by ten of them—through manufacturing medium grade ore into a rich product—milling is really a manufacturing process. Think of these ten mines, plus rich ore and plus additional mines which will develop on this property, plus the rich gold bed that underlies this entire area of ground as demonstrated in our neighbors' ground, plus the enormous possibility of the radio ore. Think what all of this will mean to you in terms of profits and happiness.

"Think of having the benefit of the wisdom and experience of a *mining man who made three hundred thousand dollars for me* before. All we have to do is to *put up the mill and milk the mines* of their wealth for our greatest good, this is the easiest thing to do in this case.

"The way to get rich is through multiplying your dollars. This is an extraordinary opportunity to multiply your dollars many, many times. I expect you as my pupil, to come into this matter with me. I want to make some money for you. I want you to make some money without slaving for it. This mill will make it for you as it will make it for me.

"Remember, this is not all. The additional possibilities multiply the present resources by many times. There is nothing but riches ahead of us in this action. Remember, I already have more than thirty-five thousand dollars on hand from my pupils. Therefore, hurry. Do not be too late.

"It is my aim ultimately to list this stock on an eastern exchange, and thus create the best market for it. *Our action will not only bring us riches in terms of dividends, but also in high prices for our stock—a double source of wealth.*

"Be sure to register your letter and use the enclosed envelope, so that your remittance reaches me personally, and without delay. Remember, I have never seen an opportunity like this before, because it contains already visible riches, but also vast and greater possibilities.

"I am so absolutely enthusiastic about this proposition, that nothing but your utmost remittance will satisfy me.

"Sincerely yours,
"ALOIS P. SWOBODA.

FROM .....

RUSH

.....

.....

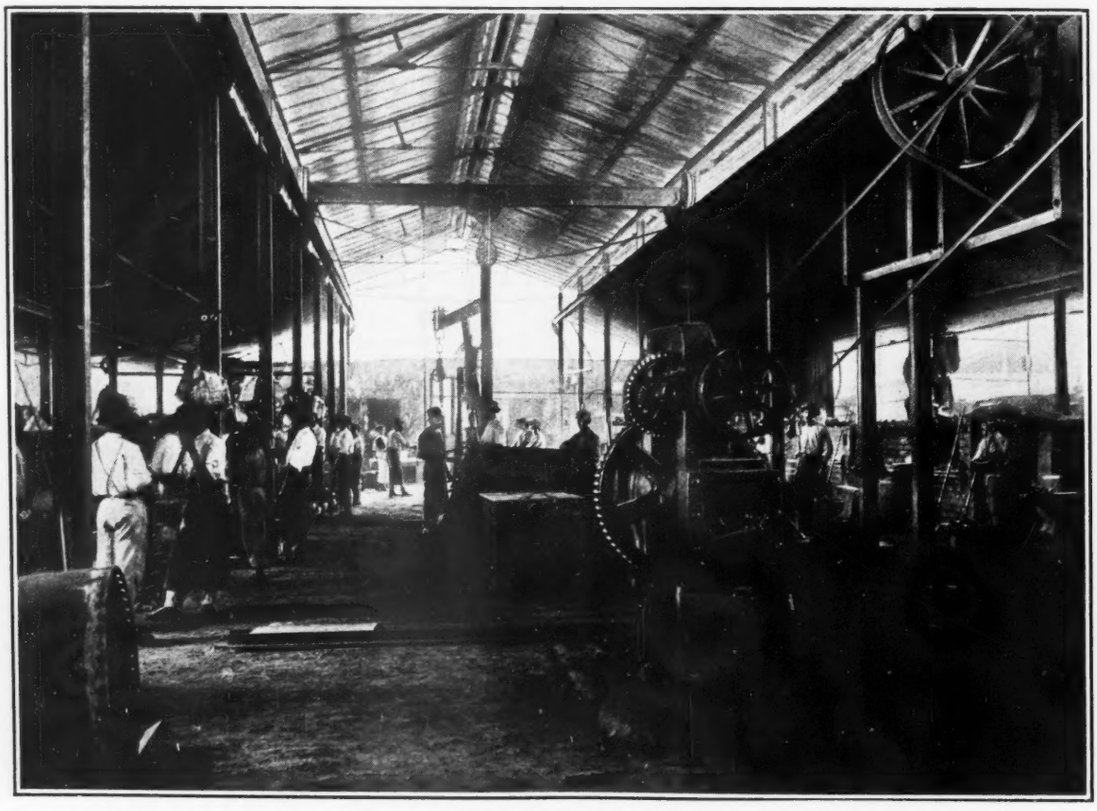
JMM

ALOIS P. SWOBODA, Personally
1115 Berkeley Building
21 WEST 44th STREET
New York City, N. Y.

REGISTERED MAIL.
Return Receipt Requested

"I enclose reduced drawing of the mill we will put up for manufacturing rich ore out of these mines."

A Busy Mine Shop in Brazil



Labor seems abundant at Morro Velho, Brazil, where the St. John del Rey Mining Co. is operating. The photograph shows the machine shop of the "deepest mine in the world"

Coal as an Aid in Oil Exploration

Its Character in a Given Locality May Serve as an Indication of the Presence or Absence of Petroleum

By Ernest R. Lilley
Assistant Professor of Geology, New York University

IN THE EXPLORATION of new areas in search of oil the work of the geologist is commonly divided into two phases. The first is the location of wide areas which seem to have possibilities of yielding oil and their division into sections of more or less promise, with the view of starting, in those which promise the most, more detailed study. In the second, the geologist carries on the detailed study that leads to the actual location of the drilling site.

Mapping with the plane table and alidade should never be attempted in a new and untested section until a thorough study of the underlying geologic conditions has been made. The object of such detailed work is the location of a structure—an anticline, a fault or a terrace—in which accumulation of oil might take place. In areas close to hundreds of producing wells such work is justifiable and likely to prove profitable. On the other hand, the drilling of a hole in an area several hundreds of miles away from any other successful tests, merely because a well-developed structure has been located, is not justifiable. The red shales and sandstones of the Newark formation of New Jersey have been folded and faulted so that they would lead the geologist who worked on this basis to advise the drilling of possibly hundreds of wells in that state. Because geologists are fully aware that rocks of such color have little possibility of containing oil in commercial quantities they are shunned all over the world.

Dark or Black Sedimentary Beds Are Favorable Formations

On the other hand, sedimentary beds which are either dark blue or black in color are considered by all to have possibilities of production until proved barren. If an active seepage of oil is found, the proof of the existence of oil is complete and the geologist may safely proceed to search for a structure. If a well-developed fold is found, a test can be started with the feeling that all possible precautions have been taken to reduce the element of risk. If oil is found, it is natural to assume that wherever the same succession of beds occurs similar structural conditions should yield oil also. This, however, does not always follow. The formations which yield oil in western Pennsylvania yield only gas a little to the east. In central and eastern Pennsylvania neither is secured. The shales in the latter sections are just as dark in color and the sandstones in which accumulation might take place apparently as numerous. Except that as one goes from west to east the rocks become more consolidated, there is no great difference in appearance.

The scores of wells drilled in search of oil in the gas and barren zones of Pennsylvania and the neighboring states of New York and West Virginia bear mute testimony to the failure of the early drillers to understand the reasons underlying this zone arrangement. Now that more is known of the origin of oil and the processes of alteration that it passes through, many dry holes may be avoided in other sections.

Possibly the solution to this problem can be most clearly brought out by tracing an assumed course of the oil from a time when it is laid down in the form of an organic mud to the condition in which it exists today. Most geologists believe that oils are derived from material of an organic nature. The exact character of this source material is still in doubt. In California, the evidence points strongly to its derivation from the microscopic diatom. In Galicia, the wide extent of fossilized fish remains would indicate that that type of life was an important factor in the formation of oil. The land-plant theory seems to account for the oil in many sections of the globe. However, all are so closely related that adherence to one theory does not imply rejection of the others. It seems probable that all of the various types of organic life have contributed in some degree to the formation of oil.

The ideal condition for the deposition of clays saturated with organic material is found in the low-lying coastal plain, with its wide mud flats facing the sea and surrounding its bays and inlets. These flats form an ideal place for the accumulation of spores, pollens, exines, cuticles, and other resinous bodies that may be carried by the wind and by streams from the land, and their intermingling with the remains of the low forms of life of the mud flat. Marine waste may at the same time be supplied by the sea. In addition to the organic material, inorganic silts and dust may be expected to accumulate in large amounts. The mixture gradually takes on the nature of a clay. To it, because of the resinous character of the organic material and the absence of the woody parts of plants and trees, the name "sapropelic clay" may be given.

From this as a base all of the members of the petroleum family may be derived. Under pressure the clay loses much of its water content, becomes more compact and takes on the characteristics of a shale. As oil can be secured from such shales by the simple process of heating, they are commonly known as oil shales. If tested with ordinary petroleum solvents they are found to contain practically no oil before the heat is applied. Because of this I prefer the term kerogen shale—a shale from which oil may be derived.

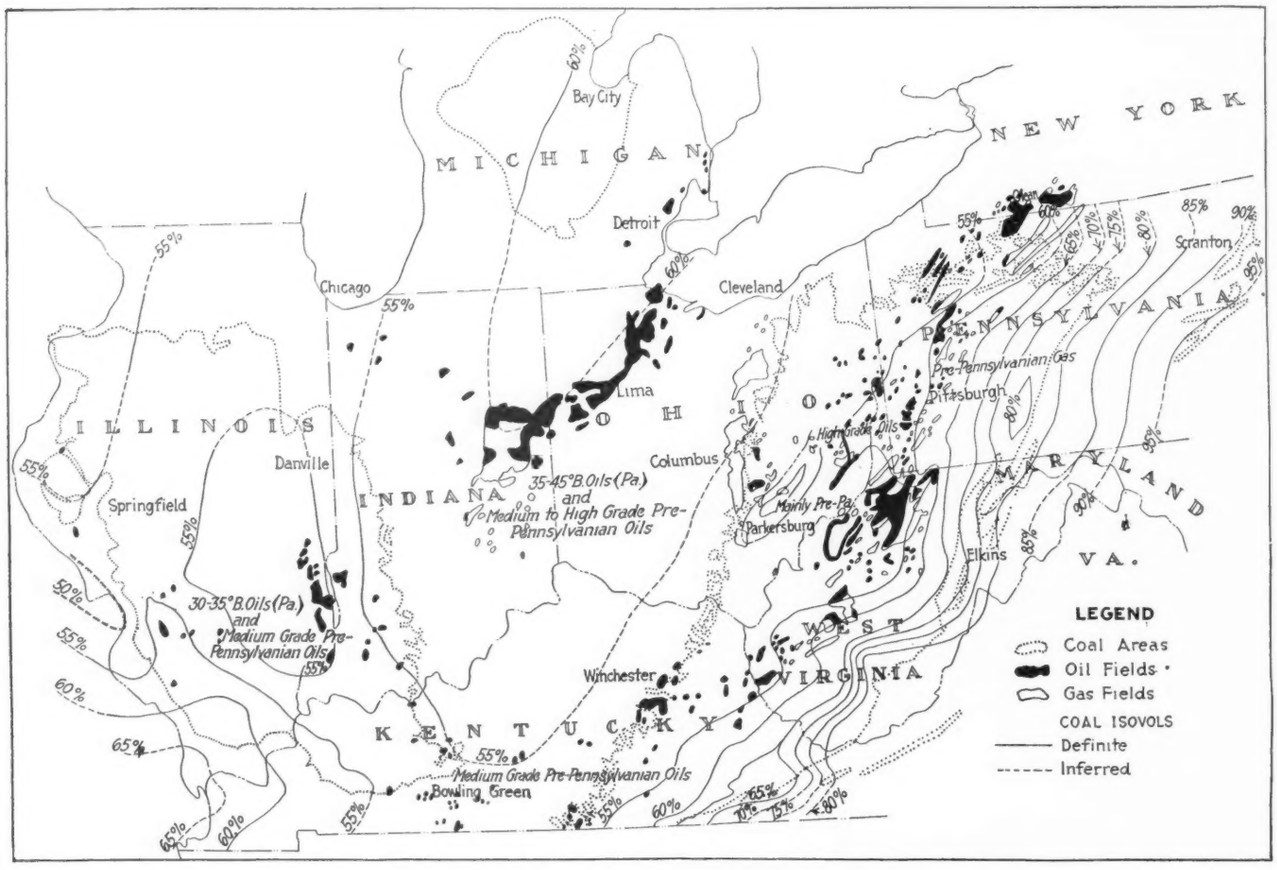
Pressure Alone Will Generate Oil

Oils have been produced on a large scale in Scotland for a number of years by the application of heat. In America we expect to produce shale oil in quantity in a short time. Though shales vary considerably in character, the nature of the product secured in the laboratory and commercial retort is determined to a considerable extent by the temperatures used in distillation. In most cases the oil is a heavy viscous type closely resembling asphaltic base crude petroleum. Its content of unsaturated and napthene base compounds runs very high.

The work of McCoy[1] has demonstrated that pressure will generate oil in the same way. In nature the genera-

[1]McCoy, A.: "Principles of Oil Accumulation," *Journal of Geology*, Vol. XXVII, p. 252, 1919.

tion of oil seems to have been accomplished by the overburden of hundreds and even thousands of feet of sediments laid down above the kerogen-bearing beds. As an almost unlimited amount of time is given for the reaction, the absence of high temperatures does not prevent its occurrence. Though some chemical change takes place in the creation of the liquid petroleum and in its expulsion from the shales into the porous sandstones and limestones adjacent to them, the degree of alteration of the kerogen bodies is not great. The most important change is the decrease in the percentage of carbon. This is apparently left behind in the shales in considerable amounts. While the exact percentages may vary, byproducts in the form of nitrogen and natural gas seem to be evolved in large amounts at this time.



The Eastern Province. Eastern Interior and Appalachian coal and petroleum fields

After this viscous asphaltic oil has entered the porous rock it is subjected to conditions almost identical with those existing in the cracking still. Again in nature's process pressure takes the place of heat to a large extent. In this stage the pressure seems to have been supplied by movements within the crust of the earth rather than from excess sedimentation. Unlimited time is allowed for reactions as before. The intensity of the alteration or reaction seems to be directly proportional to the intensity of the dynamic movement. Thus, if the oil is imprisoned in a sandstone at a point a hundred miles away from the center of the crustal disturbance, the alteration may be expected to be less intense than if it were only ten miles from it.

In the cracking still in the refinery the chemist creates from complex heavy compounds, which are usually the higher members of the various unsaturated and cylic series, the lighter and less complex members. A considerable quantity of compounds of the paraffin series may also be created. Thus, from the non-volatile heavy gas or fuel oil the refiner secures light gasoline stock. Coke or residual carbon and still gases are commonly created in large amounts as byproducts in the process.

In most commercial plants the lighter constituents are volatilized and separated from the heavier ones, which are left in the still. In nature's laboratory no separation is made. The asphaltic base oil changes to one of mixed base that, while still containing asphaltic constituents, also contains the lighter paraffin ones.

If the process is carried farther the asphaltic constituents may disappear and the product be composed almost entirely of the light compounds of the paraffin base group. Many of the oils of Pennsylvania are so low in their content of asphaltic constituents that they may be said to have passed into this stage. The paraffin series contains compounds that are liquids, solids and gases at normal temperatures. Those that are solids are the highest and most complex members, the gases the lowest, least complex and the most stable. If in cracking the still becomes overheated or the pressure excessive, the amount of fixed gas and residual carbon created becomes excessive. In nature, as the dynamic pressure is increased, the solids and gases are destroyed and dry gases, composed almost entirely of methane, and residual carbon are formed. Ultimately, if the pressure becomes too severe, the methane is destroyed and the volatile hydrogen gas evolved. Because of the small size of the hydrogen molecule, this gas easily escapes

from the beds containing it to the atmosphere, and is lost.

When it be remembered that the raising of the Appalachian Mountains in the State of Pennsylvania was caused by dynamic pressure from the east immediately after the sediments now yielding the oil and gas were laid down, it is easy to understand what has taken place in this region. The next thought is the finding of means of foretelling such conditions in other areas in advance of the drill.

The sediments that were laid down above and below the oil-bearing ones were certainly subjected to the same forces—first the static pressure from above and later the dynamic pressure from the east. The alteration is clearly visible in the beds along the eastern border of the state. These are distinctly metamorphosed and have lost much of their original sedimentary character. Such areas have long been recognized as having little to encourage the oil prospector.

Metamorphic alteration of rocks does not begin until the destruction of the oil series has been practically completed. Even the early stages of rock metamorphism, such as sericitization, are not developed to a visible degree prior to the disappearance of the hydrocarbon series. While wide areas can be considered as lacking in oil because of the metamorphosed nature of their beds, there still remain hundreds of square miles in Pennsylvania alone which yield neither oil nor gas and yet are not distinctly metamorphosed.

Character of Local Coal a Possible Indicator

In the case of one substance, coal, the alteration takes place at approximately the same time as does the alteration of the hydrocarbon series. In fact, the alteration is spread over a longer period. As the end products in the oil series are reached before the alteration has been completed in the coal series, it would seem probable that the presence or absence of oil (other factors being favorable) and even the nature of the oil might be inferred from the character of the coal found in any given locality.

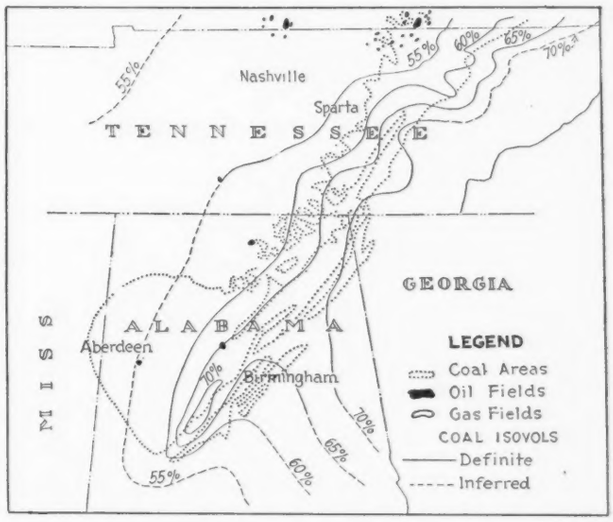
At the same time as the sapropelic clays are being laid down on the mud flats along the coast, peat beds may be formed *in situ* in the swamps back of the water front. In the period during which the clay is being consolidated to form a shale, the peat is losing much of its original content of water and being converted into brown lignite.

The critical stage in the oil series, namely the period in which the oil is created and expelled from the shale, seems to correspond to the period of formation of black lignite or sub-bituminous coal. Areas where subbituminous coals occur are generally areas in which asphaltic and heavy mixed-base oils are found. Where the coal is of low bituminous grade the higher grades of oil may be expected.

In sections of high-grade bituminous coals gas is found, but oil is commonly lacking. This gas is generally dry—that is, lacking in natural or casing-head gasoline—in contrast to the gases found associated with the oils which commonly contain commercial percentages of it. In sections where semi-bituminous and anthracite coals are found, oil and gas are unknown in commercial quantities.

The early studies of White[2] and Fuller led to the conclusion that neither oil nor gas might be expected in areas in which the percentage of fixed carbon in an ash and moisture free coal was above 70 per cent. The conclusions of White were reached after a study of conditions in the Appalachian field. As stated by him in 1915:

"In regions where the progressive devolatilization of the organic deposits in any formation has passed a certain point marked in most provinces by the 65 to 70 per cent of fixed carbon (pure coal basis) in the associated or overlying coals, commercial oil pools are not present in that formation or other formations normally underlying it, though commercial gas pools may occur in a border zone of higher carbonization. The approximate carbonization limits of the rocks containing or overlying oil pools may be found to vary somewhat in the different provinces according to the character of the original organic debris, the



The Southern Appalachian and Eastern Mississippi embayment coal and petroleum fields

circumstances attending its deposition, and the geologic structure.

"Wherever the regional alterations of the carbonaceous residues pass the point marked by the 65 or perhaps 70 per cent of fixed carbon in the pure coal, the light distillates appear in general to be gases at rock temperatures. Occluded oils may in some cases have escaped volatilization."

M. L. Fuller[3] has further developed the suggestions of Dr. White in his discussion on the Paleozoic fields of Texas, giving as the result of his investigations the following ratios:

Carbon Ratio, Per Cent	
Over 70	No oil or gas with rare exceptions.
65 to 70	Usually shows only in small pockets. No commercial production.
60 to 65	Commercial pools rare but oil exceptionally high grade if found. Gas wells common but usually isolated rather than in pools.
55 to 60	Principal fields of light oils and gas, of Appalachian and Mid-Continent fields.
50 to 55	Principal fields of medium oils of Ohio, Indiana, and Mid-Continent fields.
Under 50	Fields of heavy coastal plain oils and of unconsolidated Tertiary or other formations.

It is necessary to note that the values given are based on comparisons made between coals of Pennsylvanian age with oils and gases of several Paleozoic horizons. As part of the alteration of the older oils may have occurred previous to the deposition of the Pennsylvanian coals, the limits set may of course be expected to be somewhat low.

In making the following table I have restricted myself to a comparison of coals and oils of Pennsylvanian age.

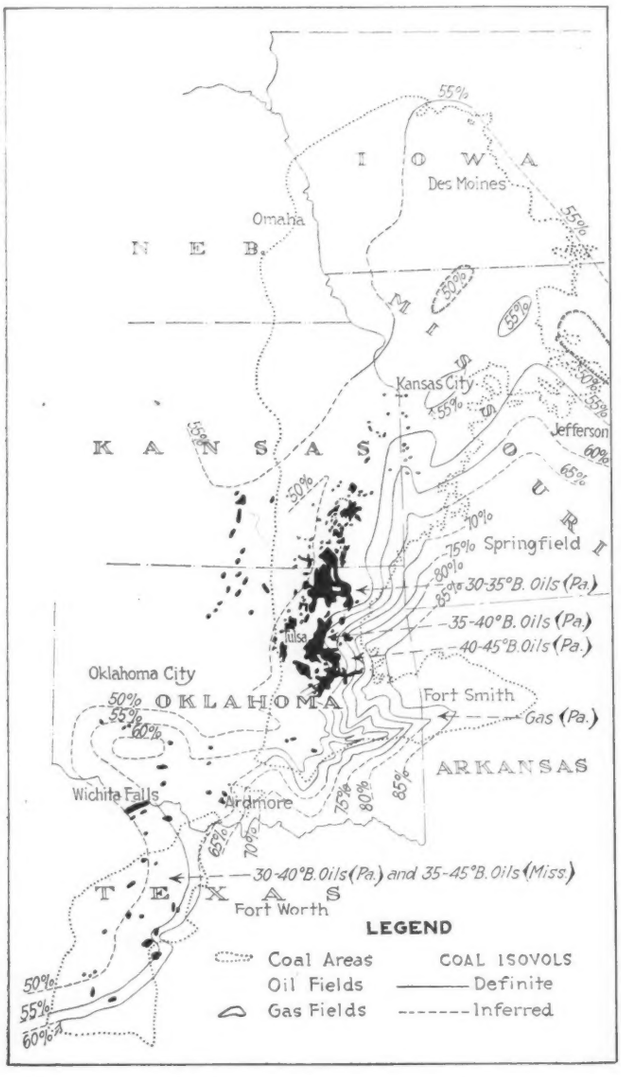
[2]White, David: "Some Relations in Origin Between Coal and Petroleum." *Wash. Acad. Sci. Jour.*, Vol. 6, No. 5, p. 212, 1915.

[3]Fuller, M. L.: "Oil and Carbon Ratios in North Texas." *Econ. Geol.*, Vol. XIV, No. 7, p. 536-542, 1919.

The limit of possible gas production has been raised, but otherwise the limits given by White and Fuller were found to hold. Though no detailed study has been made, I have found that the limits proposed for Pennsylvanian oils and coals hold for the Cretaceous also.

Fixed Carbon Content of Pure Coal (Carbon Ratio), Per Cent	Corresponding Product in Petroleum Series
50 to 55	Mixed base below 35 deg.
55 to 60	Mixed base 35 to 40 deg.
60 to 70	Paraffin base above 40 deg.
70 to 80	Dry gas only
80 to 100	No hydrocarbons

In making such comparisons it is necessary to use the utmost care in the selection of coal samples. Weathered samples are naturally not representative of the character of the fresh coal. Coals of the cannel series cannot be used as a basis of comparison, because of their exceedingly high percentage of volatile matter. The higher members of the cannel series—that is, the canneloid coals—have much the same character as the normal coals. They can for this reason be used to limit the areas of possible production. The lower members differ so radically from the bituminous coals found in their immediate vicinity that they cannot be used at all in indicating the character of the oil that may be expected.



The Mid-Continent Province

Wet gas is commonly associated with oils of all grades. Both gases and oils are free to move about in any porous container. Thus gas may be found in small amounts in regions where the fixed carbon of the coal runs higher than 80 per cent. Oils of low grade may be found in areas which would normally contain higher types.

Upward migration of high-grade oils is common. In some instances the oil is not composed solely of hydrogen and carbon but also contains relatively high percentages of oxygen, nitrogen, and sulphur. The last is the most common and the most obnoxious. It forms compounds of relatively high density. If these are present in large numbers, the suggested comparison of grades of coal and oil will not hold, although the limiting factors will be the same.

Petroleum Possibilities vs. Character of Coal

In an article appearing in the Aug. 11, 1923, issue of the *Engineering and Mining Journal-Press* I outlined the areas of the United States that I considered to have possibilities of yielding commercial quantities of oil and gas. The two maps accompanying the present article show the relation between the coal and the oil series in the Eastern and Mid-Continent provinces. The character of the coal is clearly brought out by the isovol lines —the contour lines showing fixed carbon content of coals. The general character of the oils is indicated where possible.

From the carbon content of the coals in the areas east of the producing districts of the Appalachian field it would appear that drilling in central Pennsylvania, western Maryland, eastern West Virginia, eastern Tennessee, eastern Alabama and all but the southwestern corner of Virginia is not likely to yield favorable results. If the necessary sands are found, some production should be secured from northwestern Alabama, northeastern Mississippi, and western Tennessee.

The wide area covering much of Iowa and Missouri and lying between the limits of the known production in the Mid-Continent and Eastern provinces is favorably located from the carbon-ratio standpoint. Up to the present there has been little to indicate that this area contains the beds from which oil might have been generated. The development of oil in the gas zone in eastern Oklahoma and western Arkansas does not seem probable. The prolific pools on the south slope of the Wichitas along the Texas-Oklahoma border should prove to be the forerunners of others to the west. Similarly, the section north of the Wichitas is worth careful testing. The trend of the isovol lines toward the west in north-central Texas would indicate that the area lying north of the Llano mass and west of the Bend Arch may be expected to yield commercial quantities of oil.

It is not, however, in the present producing provinces and fields that the use of the coal isovol should prove of greatest value. In the development of potential areas, such as Colorado, New Mexico, and Utah, the collection of coal samples and the preparation of isovol maps should prove a valuable aid. The collection of such samples may be made in many cases only through the expenditure of large amounts of money. In many sections only a few samples may be available. In such circumstances the most careful study of the general geology of the region must be made before the relationship can be applied. However, it may then be found possible to eliminate one element of risk in wildcat drilling.

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief

Raising Capital

THE EDITOR:

Sir—I have been much interested in the contribution by Arthur B. Parsons on "Financing the Prospect" which appeared in the issue of April 26, and the discussion in connection therewith, particularly the letter in the issue of May 17, by L. O. Goodman, relating his experience in raising development funds for his mine.

My experience to date has been on somewhat different lines, but the net result is about the same. Briefly, the property of our company consists of three mining claims in British Columbia, situated along a small river. It is crossed by the lines of the Canadian Pacific Ry., and is within easy access of a smelting works. Electric power lines are not far away. Five parallel veins of quartz carrying gold, silver, and lead are exposed, three of which have been followed for a combined distance of some 600 ft., the width varying from two to eight feet or more. No dead work is needed to reach the ore. Silver is the chief economic metal, and the veins contain varying amounts of high-grade and of milling ores.

In a word, the conditions as regards transportation, power, water, and easily reached veins are ideal. The company owns its property, and the indebtedness is trifling. Unlike Mr. Goodman's company, however, the capitalization is very low, as mines go, being only $125,000, with nearly three-fifths of this in the treasury. Our idea was to keep the capital at as low a figure as would suffice for the development, and later on, for a mill, relying on a certain amount of high-grade ore being extracted in development to help pay for the same, and to sell all shares at par (25c.), so that when we were on a producing basis the returns per share would be high, in proportion to the low capitalization.

The first effort of the officers of the company (none of whom are on salary) was to sell shares to personal acquaintances; and this went pretty well up to a certain point, and enabled us to do the development so far accomplished.

Having reached a point where we felt that the developments warranted our offering shares to the public at large, so as to complete our program of development, installing machinery plant, railway sidings, and bins, and making roads, we secured the services of a local salesman who professed to be able to sell ice to the Esquimaux. But neither this salesman nor any others were pleased with our prospectus, and wanted one of the usual flowery, get-rich-quick variety, which we would not allow; for to our crude, unsophisticated understanding the plain and honest facts seemed all sufficient. However, the public must have desired pleasant fables, as our success on these lines was nearly zero.

We next tried out the investment brokers in many cities, but nothing doing! They wanted the capital increased to millions, with impossible commissions, so that they might make a big killing; and did not care a whoop whether the property warranted such questionable financing. Our modest plan had no attraction for them. Like Mr. Goodman, we lack facilities for getting into touch with good people, who want an honest chance in a clean-cut mining venture.

An old mining friend said to me the other day: "The trouble with you is that you are an engineer, and not a promoter. You don't know how to sell shares. You are too pernickity about sticking to facts. Get out and tell people what they want to hear. That is to say, tell 'em bunk. Then you will get somewhere."

The devil may take the whole outfit if nothing but "bunk" will save it, for we will have none of it! But in the meantime a potential producer is hamstrung and hog-tied for lack of capital. Ultimately we shall find a way out, but "hope deferred maketh the heart sick."

Once upon a time there would have been no trouble at all in financing this good prospective mine; but automobiles, tax-free bonds, widespread mistrust sown by the crooks who have devastated the mining share markets, and warnings from bankers who look askance at anything speculative, have pretty near put a kibosh on the endeavors of those who would develop the resources of the West. And, if continued, these things will put an end to the endeavors of the little fellows, leaving the field to the big companies to gobble everything in sight on their own terms.

Spokane, Wash. FREDERIC KEFFER.

"Away With the Gold Standard?"

THE EDITOR:

Sir—There are two sentences in David Atkins's communication, published in your issue of May 31 under the above title, that seem to me to be contradictory. Referring to a book he has written, he says in one sentence, "I show at some length that gold will continue to be used exactly as it is today"; and in the other, immediately following, he says, "It is no use pretending that we are working on the basis of any international gold parity when the dollar, the pound, the franc, and the lira alter their relationship every couple of hours."

Of course it is impossible to discuss any subject intelligently when the meanings of the words employed are ambiguous, and I take it that Mr. Atkins in using the words the pound, the franc, and the lira really means the paper representatives of or substitutes for such coins, instead of the coins themselves; that is to say, different quantities of the metal gold.

It is no pretense that we are working on the basis of an international gold parity; in evidence of which I beg to submit the following in reference to how gold is used today:

Prior to the year 1774, the use of two different

monetary standards, gold and silver—bimetallism—had been found to be unsatisfactory by Great Britain, so in that year she adopted gold as a single standard of exchange value—simply as an experiment, for a few years. The results were so satisfactory that it was continued for periods of a few years at a time until 1799—a total of twenty-five years—when she decided to continue gold monometallism indefinitely; but the necessary act of Parliament was not passed until June, 1816. In effect, that act declared that twenty pounds troy of standard gold should be divided into 934½ parts, each full part of which was named a sovereign or pound sterling. British standard gold was then, as it is now, 916⅔ thousandths fine. Therefore, each pound sterling consists of 123.274 grains of standard gold, containing 113.0016 grains of fine gold; and, as gold is the only metal in the gold coin that is valued, the real pound sterling is 113.0016+ grains of fine gold.

Incidentally, it may be said that it is very instructive when studying the subject of money to actually figure out one's self all the different calculations that are involved in determining the relationship-relativity of the different standard units of value that are used by different nations: in fact, it seems to be absolutely essential to a proper understanding of what is commonly considered to be a very abstruse subject, but which, instead, is very simple when one really comprehends its basic principle.

With respect to the dollar, the standard unit of value first chosen by the Congress of the United States, in 1792, was 371¼ grains of fine silver, to which the name dollar was given. Gold was also coined into pieces of different weights, which were named eagle, half-eagle and quarter-eagle, containing 247½, 123¾, and 61⅞ grains of fine gold, respectively, being intended to be equal in monetary value to ten, five, and two and one-half silver dollars, respectively; but the name dollar was not applied to gold coins till fifteen or twenty years later, and then only because the silver dollars had practically disappeared from circulation. Our present gold dollar of 25.8 grains of standard gold—23.22 grains of fine gold—was not adopted by the Congress until 1837, when it practically displaced the silver dollar as our standard unit of value. Few seem to realize the difference between a standard of value and the standard unit of value; the latter is simply that certain quantity or amount of the former which is used as the unit of measurement.

Now let us take up the standard unit of value that was chosen by the Latin Union, in December, 1921, "on which the budget of the League of Nations is to be calculated." The representatives of Belgium, France, Switzerland, Italy, and Spain, which nations together comprise the Latin Union, agreed upon a standard unit of value consisting of 4.9781784+ grains of standard gold nine-tenths fine, containing 4.48036+ grains of fine gold. This quantity of gold has been named a franc, by Belgium, France, and Switzerland; Italy has named it a lira, and Spain has named it a peseta: but each of said names means the same quantity of gold.

Therefore, the pound sterling is 113.0016 grains of fine gold, which has not been changed in 108 years. The dollar is 23.22 grains of fine gold, and that has not been changed in eighty-seven years. And the franc of Belgium, the franc of France, the franc of Switzerland, the lira of Italy, and the peseta of Spain are each one and the same amount of gold, and it has not been changed since December, 1921.

The "relationship" of these three different standard units of value, consequently, is as 113.0016 is to 23.22 and to 4.48036, or as 4.8665 is to 1.0000 and to 0.19295. Or, in accordance with the names that have been given to these quantities of gold for ease of calculation and simplicity of expression, a pound sterling is both 4.8665 dollars and 25.221 francs, lire or pesetas; and the dollar is 5.18+ francs, lire, or pesetas; and the franc, lira, or peseta is 19.295 hundredths of the dollar; or, since one one-hundredth of the dollar is one cent, the franc, the lira, and the peseta is 19.295 cents each. The pound sterling is worth 4.8665 dollars because it is 4.8665 dollars, and the dollar is worth 5.18+ francs, lire, or pesetas because it is 5.18+ times as much gold as is contained in a franc, lira, or peseta, respectively. Hence, they do not alter their relationship every couple of hours.

So far so good. But, unfortunately for the arguments nowadays of many so-called economists and most people, Mephistopheles, in the guise of national credit or paper money, has entered into the financial arena since the beginning of the World War, and, as a consequence, a confusion of words and terms has resulted. Names that were once used to designate particular quantities of gold are now used indefinitely to mean either a standard unit of value or what is virtually a government's promise to pay the quantity of gold named in such standard unit of value. And the various degrees of inability to pay, on the part of different governments, are measured by the expression of opinion of the commercial world in the sundry quotations of exchange as they appear in the principal newspapers. It would seem as if his satanic majesty had deprived most economists as well as the public in general of the ability to comprehend the vital difference between a commodity, such as gold, and a nation's credit in the form of a promise to pay gold. And so long as this failure to differentiate between a commodity and a credit shall continue, just so long will great confusion prevail in considering the subject of what is commonly called money.

The quotations of foreign "money" as they appear in our newspapers in terms of the dollar are really quotations in terms of 23.22 grains of gold, because the dollar is that quantity of gold, whereas the foreign "money" is foreign credit.

Hence, it is a self-evident fact and not a pretense that we are working on the basis of an international gold parity.

Much of the confusion of thought regarding this subject would disappear if the terms "paper pound" or "paper sterling" or "paper franc" et cetera would be used whenever the credit pound, credit sterling or credit franc and so on is meant, leaving the unqualified names of the different units of the standard media of exchange to mean their respective weights of gold.

New York City. W. DE L. BENEDICT.

An Asphalt Well

THE EDITOR:

Sir—The article "Oklahoma Well Yields Liquid Asphalt," in the May 17, 1924, issue of the *Mining Journal-Press*, recalls my experience with a well of the Kern Trading & Oil Co. at Casmalia, Calif., a number of years ago. This well produced a heavy oil that might easily be termed a liquid asphalt, having a specific gravity of 1.012, about 9.75 Bé, which under standard

asphalt tests had, as I recall, only 7 per cent more volatile matter than a refined asphalt. Its lightest fraction in refining was but 38 deg. Bé.

The well was originally drilled to a depth of about 2,800 ft., but was put on the pump at 1,600 ft. The oil was extremely viscous, like that described from the Scott well, the tubing or sucker rods sinking into the hole very slowly, often requiring twenty minutes for one stand of rods, 60 ft. long, to run into the hole. Repeated efforts were made to pump this well by ordinary methods, using 3-in. tubing, with little or no success, as the engine could not be run slowly enough to keep the walking beam from traveling faster than the rods, with a consequent battering that soon broke crossheads and rods.

Finally we had a double casing ring made and lowered a string of extra-heavy 2-in. tubing alongside the 3-in. pumping string, with a plug in the bottom of the 2-in. line. Inside the two was lowered a string of extra-heavy 1-in. pipe. Steam coils were laid in one of the water tanks and hot water was circulated through this string of pipe by a tail pump on the beam. As a result, the heavy oil became so hot that it could be pumped as easily as ordinary oil. But for the fact that the water had not been shut off when the well was drilled there is no question that a steady production could have been maintained. Until the water broke in, the well pumped at the rate of 350 bbl. a day.

In physical characteristics the oil was like that described from the Scott well, but it had this added peculiarity: it contradicted the old saying that oil and water won't mix. The oil coming from the well would carry up to 40 per cent water without the slightest change in appearance. Water would not settle out, nor could it be removed in a centrifuge. Its presence could be detected and measured only by cutting with xylene, and distilling off the water. JOHN CARTER ANDERSON.

Beverly Hills, Calif.

A Central Clearing House for Mine Promotions

THE EDITOR:

Sir—The article "Financing the Prospect," by Arthur B. Parsons, in your issue of April 26, 1924, although partly exposing some of the methods used by fake and fraudulent stock promoters, does not offer a solution to the problem faced by the prospector, mine owner, or small capitalized company.

Plan No. 3 is very nice and would offer a remedy all right *if* a selling campaign of this kind would be considered by square-dealing brokers or sales organizations, but we fail to know of any such willing to handle any proposition at the reasonable commission of 20 or 25 per cent.

We have on file offers from such sources ranging from New York to San Francisco and from the Canadian to the Mexican borders, to place stock on a commission basis of from 50 per cent up—mostly up; which of course we never considered. Other propositions demand "special bonus" "controlling interest" "extra selling funds in advance," and what not.

The small, honest, and square mining enterprise has just one possibility left and that is to try to raise the money directly; and that is a harder job—far harder—than to make the mine after you get the money.

What we need is an education of the public at large, and only the press can accomplish that, although it is an open question if the interests behind the press would sanction such propaganda of investment education.

Therefore the only method left open for the honest mining organizations is to form an association with headquarters in some financial center to represent the interests of its members. The association should have a weekly publication exposing the crooked and fraudulent enterprizes and methods, which should be mailed free to investors. Advertisements would be accepted at a nominal rate, after investigation of such company or individual. Reports by reputable engineers, or extracts from them, should also be published by this organ. The office would also act as sales broker on all listed and advertised mining securities of the association and should receive therefore a commission of, say, 25 per cent on all sales to defray office and publication expenses.

This would create a clearing house for the prospector, mine owner, and small company; that is what we need. No doubt there are enough *honest* mining men in the United States to make such a Mining Exchange possible.

We offer the above opinion as the result of our own experience and are ready to join such a crusade for the benefit of legitimate mining promotions.

Hachita, N. M. LITTLE HATCHET MINING CO., INC.

Commercial Definition of Platinum

THE EDITOR:

Sir—My attention has been called to two misquotations in my article on the proposed platinum stamping act legislation, which appears on page 800 of the May 17 issue of the *Engineering and Mining Journal-Press*. I would be glad if you could correct these statements.

The second paragraph in the first column on page 800, under "Opinions of Interested Parties," should read as follows instead of as printed:

"We are in favor of a law to restrict the use of by-metals to say 25 per cent, and any piece of jewelry can be called platinum if it contains at least *75 per cent platinum itself* and 20 per cent to 25 per cent platinum by-metals—whatever they are."

The first paragraph in the second column should read as follows instead of as printed:

"Articles consisting of not less than 950/1,000 parts pure platinum where solder is used or 985/1,000 pure platinum where solder is not used, may be marked platinum (abbreviated 'Plat.'), and sold as platinum."

San Francisco, Calif. J. M. HILL.

When Front Is Back

THE EDITOR:

Sir—I have just read Mr. Robie's interesting article in the May 24 issue of the *Mining Journal-Press* and note the question of page 846: "Why is the flue end of a reverberatory called the front, and the firing end the back?"

It is my understanding that this designation of a firing end and a flue end of a reverberatory comes from its similarity to a locomotive. I have asked this question myself a number of times of old-timers in the smelting business who have operated reverberatory furnaces from the time of the small furnace to the present large reverberatory, and have always received the same answer. This is the only explanation of the term that I have ever been able to find. FRANK CORWIN.

Carteret, N. J.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

A TRIAL SHIPMENT of zinc concentrates has been made to Belgium by the Golden Rod Mining & Smelting Co. of Tar River, Okla., in the Tri-State district. Arrangements are being made with foreign agents for increased shipments, it is said.

Silver producers will be summoned to a conference with the Senate Commission of Gold and Silver Inquiry at Salt Lake City on Aug. 11, it is expected. This date is said to be agreeable to the commission.

Fifty thousand dollars for advertising zinc, particularly for galvanizing purposes, has been raised in the Tri-State district. This achievement is considered as a feather in the cap of the Institute's new president, A. E. Bendelari.

Further efforts to unionize the miners of the Joplin-Miami district are being made by the United Mine Workers of America, it is rumored locally. Operators are ignoring the matter.

Attempted reorganization of the Candelaria Mines has failed. The option on the $400,000 mortgage held by the Rochester Silver Corporation was allowed to lapse.

The Mohawk Mining Co., in northern Michigan, is preparing to sink on the Pewabic lode, west of the Wolverine. This is the most northern development attempted on the lode.

A dividend of 8c. per share by the Premier Gold Mining Co., of British Columbia, is expected on July 5. This will bring the total paid to date to $5,688,000.

Roasting a pyrite deposit in place with expectation of leaching it later is being attempted at the Copper Belle property of the Shannon Copper Co. at Gleeson, Ariz.

The Nipissing Mining Co. has taken men and supplies from Angliers, Quebec, into the Rouyn district by airplane recently. The trip, ordinarily taking three days by water, requires forty-five minutes by air.

Efforts to Unionize Joplin District Renewed

Rumor Says So; Operators Non-Committal

Rumor concerning the unionization of the Oklahoma-Kansas-Missouri zinc-lead district has been renewed. The union organizers, who have been in the field for some time, are publishing a weekly paper at Picher, Okla., and it is reported the organization is so far completed that in the near future every worker will be asked to show his union card when he appears for work at the mine in the morning, and if he has none will be told to get one before he can go to work.

Operators have adopted a non-committal attitude in regard to the effort at unionization, maintaining their belief that the workers, who are all white Americans, will refuse to ally themselves with the United Mine Workers organization, or any other that accepts foreigners.

Reported Discovery of Gold in Madera County, Calif.

Local reports indicate a discovery of gold ore near Hildreth, 25 miles northeast of Madera, Calif. The find is said to be in the close proximity of the old Hanover mine. G. P. Williams and J. O. McDonald are said to have made the discovery. The ore is high grade. A small mill is being erected.

Oklahoma Zinc Ore for Belgium

Trial Shipment May Be Forerunner of Others of Importance

THE Golden Rod Mining & Smelting Co. shipped several hundred tons of zinc ore to Belgium last week, which may be the start of a considerable movement of ore to Europe.

Some weeks ago announcement was made of shipment of zinc ore from the Trail plant, near Vancouver, to Belgium, and local producers concluded if ore could be shipped from there, via the Panama Canal, it would be practical to ship the higher grade and purer ore from the Tri-State district via Galveston. Investigation was started, and the shipment last week was made as a trial of the scheme. It is rumored a representative of a big Belgium concern is due to arrive in the district field soon, and that his concern will take as much as 30,000 tons a month if it can get it. Another concern is reported to want 10,000 tons a month, if it is found practicable to deliver it, and if contracts can be made.

Lower costs abroad are apparently expected to enable the foreign smelters to make contracts profitable to both sides.

Park City Company Elects New Board

Park-Utah Mine to Pass Dividend and to Push Development

The Park City Mining & Smelting Co., of Park City, Utah, elected the following board of directors at its recent annual meeting: Moylan C. Fox, Oscar W. Friendly, Adolph G. E. Hanke, of New York; Otto Luedeking, of Cincinnati; G. W. Lambourne, and Edward Rosenbaum. Mr. Lambourne is president and managing director; Moylan C. Fox, vice-president; Oscar N. Friendly, manager; D. C. Murphy, treasurer; W. A. Dunn, secretary, and George A. Krueger, superintendent of mines.

The Park-Utah mine, of which Mr. Lambourne is also president, will pass its quarterly dividend of the same date. The directors give as the reason the advisability of concentrating on development work.

Gold Dredge Ready to Operate Near Baker City, Ore.

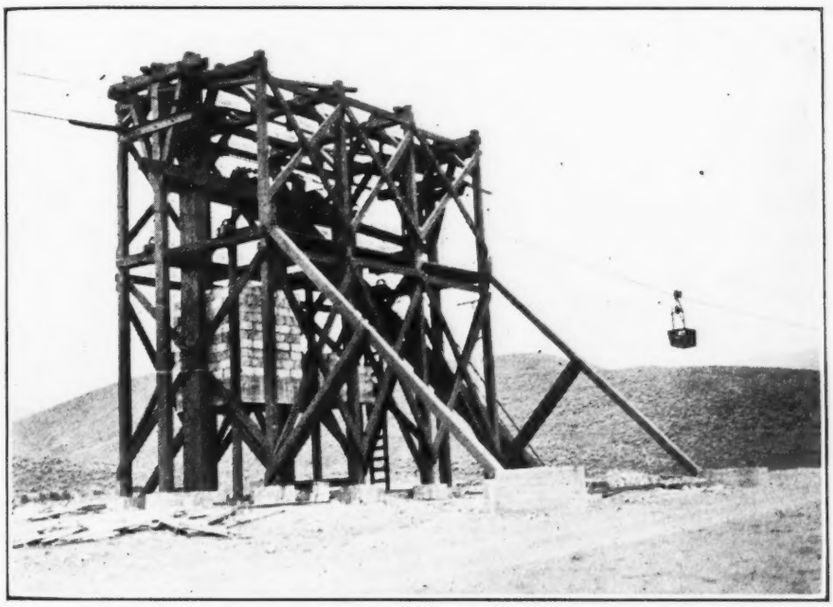
The Superior Dredging Co., financed by Utah capital, has constructed and placed in operation a 7.5-cu.ft. bucket dredge of modern construction in the placer district contiguous to Baker City, Ore. The dredge is designed to dig 40 ft. below water level. D. H. Blossom is superintendent and M. Ashley dredge master.

Pacific Portland Cement Co. Starts New Plant

Gypsum Deposit Near Gerlach Will Be Worked Nine Months in Year—Capacity 600 Tons Per Day

THE NEW PLANT of the Pacific Portland Cement Co. near Gerlach, Nev., was placed in operation May 24, 1924. Officers of the company and invited guests from San Francisco and Nevada were in attendance. The plant is 5 miles from Gerlach and 5 miles from the gypsum quarry, which is 1,000 ft. in elevation above the plant. A standard-gage track connects the plant to Gerlach, and transportation of gypsum from the quarry is by wire rope tramway. Power is generated by three 800-hp. Diesel engines (Price type) which are direct-connected to generators.

Pacific Portland Cement Co.'s new gypsum plant near Gerlach, Nev.



Wire rope tramway of Pacific Portland Cement Co. near Gerlach, Nev.

The quarry is equipped with a Marion electrically operated shovel, having 1¼-cu.yd. bucket and caterpillar tractors, and 20-ton cars. The cars are hauled by a Plymouth locomotive and dumped by a revolving tipple at the loading end of the tramway. The gypsum is crushed by a hammer pulverizer and delivered to the bins of the tramway.

At the plant the material is stockpiled and delivered when required to the bins supplying the grinders and kettles by a belt conveyor. The calcining plant contains six standard kettles, grinders, concrete bins, and equipment for sacking and mixing. The capacity of the plant is about 600 tons per day. It is planned to operate the quarry nine months in the year, stockpiling sufficient gypsum to operate the calcining plant the entire year. Prior to plant construction the gypsum deposit was diamond drilled and a sufficient tonnage proved to operate the plant for many years. The Mound House quarry and plant of the company will be shut down, as this deposit has been about exhausted by the work done in the past.

Consolidated Sued for Alleged Patent Infringement

A suit has been brought in the Superior Court, Montreal, by French's Complex Ore Reduction Co. of Canada, Ltd., against the Consolidated Mining & Smelting Company of Canada, Ltd., to recover $8,000,000, should the latter company fail to render an accounting of profits alleged to have been made through the infringement of a patent for the extraction of zinc, which is owned by the plaintiff company. The court is also asked to issue an injunction to restrain the smelting company from continuing to use the process, which was patented by Andrew G. French, the promoter of the company.

The declaration of the plaintiff states that French, who was formerly technical manager of the Sheffield Smelting Co. of Sheffield, England, went to British Columbia in 1909 and after three years' work succeeded in inventing a process for extracting zinc from refractory complex zinc-lead ores by means of electrolytic treatment. He patented the process and transferred his rights to the plaintiff company.

Part of the gypsum deposit of the Pacific Portland Cement Co., near Gerlach

Roasting Pyritic Ore in Place—An Experiment in Arizona

THE Copper Belle mine, of the Shannon Copper Co., at Gleeson, Ariz., is the scene of an interesting experiment, the outcome of which will be watched with interest. The ore in this mine is low grade, composed almost entirely of pyrite, with small amounts of chalcopyrite and bornite.

To test the possibility of recovering at least some of the metal by methods that would not involve expensive mining operations, one of the shafts was bulkheaded off and a fire was started recently on the 400-ft. level with crude oil and wood. That combustion of the pyritic ore is well under way is evidenced by the fumes that are escaping from the mouth of a second shaft, the first being reserved as a means of supplying leaching water underground after the lapse of a year or so, when it is expected that the fire will have burnt itself out. In the meantime, operations are confined to keeping the water level in the property below the fire zone.

At the conclusion of the "roast" the workings will be submerged, and the resultant copper solution will be pumped to the surface and impoverished of metal in the usual manner. The experiment will serve to determine the feasibility of roasting as well as leaching copper ore "in place."

British America Nickel Loses Action in Court

M. J. O'Brien, Ltd., Gets Decision Involving $625,000

An action brought by M. J. O'Brien, Ltd., against the British America Nickel Corporation was decided at Toronto on June 12 by Judge Kelly in favor of the plaintiff. M. J. O'Brien, Ltd., held $625,000 first-mortgage bonds of the Nickel Corporation, part of an issue of $6,000,000. In December, 1920, the corporation decided on a plan for the reorganization of its finances. This involved the retiring of bond mortgages and the creation of three issues of securities — namely, first-income bonds, $6,000,000; "A" income bonds, $6,000,000, and "B" income bonds, $12,500,000.

The holders of bonds of the original $6,000,000 issue received "A" income bonds par for par in exchange for their securities. The plan was approved by holders of all securities with the exception of M. J. O'Brien, Ltd., who claimed that it was not binding on them, and was carried out. The court upheld the plaintiff's claim for a declaration that the plan was not binding upon them and gave judgment in their favor for $625,000, with interest from August, 1920, on that amount and on arrears of interest.

Lighter Tax Burden on Mines Sought in British Columbia

A deputation, which included J. J. Warren, president of the Consolidated Mining & Smelting Co., of Canada; Valentine Quinn, comptroller for the Granby company; Thomas Graham, general manager for Canadian Collieries; Mortimer Lamb, secretary of the British Columbia branch of the Canadian Institute of Mining and Metallurgy; and representatives of boards of trade for Vancouver and towns in eastern British Columbia, recently waited on Premier Oliver of British Columbia, to urge that the depreciation of both metal and coal mines and the interest on borrowed money should be deducted from profits before an assessment for taxation be made; that profits reinvested in mining or metallurgical development or equipment should not be subjected to income tax; that no restrictions be imposed to prevent the treatment of mines' and smelters' products in foreign countries or elsewhere outside of British Columbia; and that the government should make a liberal appropriation for roads to mines.

The deputation expressed its approval of the policy of the government in offering a bounty on pig iron produced in the province, rather than guaranteeing the debentures of any corporation or individual that proposed to establish an iron and steel industry. The delegates were very emphatic in stating that any additional taxation of smelter products was likely to result in the closing down of existing plants.

Arcadian Consolidated Development Continues to Open Rich Ore

At Arcadian Consolidated, in the Michigan copper district, there is no diminution of the rich showing of copper in the 950 level north drift from the New Arcadian shaft. For nearly 600 ft. this opening has been in ground heavily charged with copper, and the breast of the drift is still studded with small mass. There are evidences that the 1,250 level north drift is approaching the same copper shoot. The copper content of the vein is becoming heavier.

Ventilation is still fairly good in the drifts, and the present program of development will continue. Three distinct copper shoots or "chimneys" have been opened in the property and a considerable area of stoping ground is available.

Electric Smelting Investigated at White River

The White River Chamber of Commerce, in Arkansas, is investigating electric smelting with a view to introducing it in the zinc-lead areas of upper White River on the completion of the Dixie Power Co.'s hydro-electric plant near Yellville. J. H. Hand, of Yellville, is interested.

Tri-State Zinc Producers Hope Output Will Be Curtailed

Rely on Individual Action—Some Operators Will Close July 2 for Two Weeks

Efforts of zinc ore producers in the Joplin-Miami zinc-lead district toward individual curtailment of output, made necessary by a demand that is less than production, are being continued. During the last week production was reported at approximately 13,100 tons of zinc ore and 2,100 tons of lead ore. A total of 132 mills were operating during the week, eleven of which operated double shift. The overproduction, or apparently surplus of output over demand, amounted to about 1,500 tons, and is laid primarily at the door of the mines operating double shift. However, some of these companies cannot avoid this, because of expiring leases.

Several mines that so far have refused to curtail output announce plans of doing so, beginning the week of July 2, when they will close entirely for two weeks. One of the largest individual mines in the district, that has been forced to operate a double shift on account of its lease situation, announces it will close at that time. It is believed that the curtailment resulting from these closings will amount to not far from 7,500 tons, which should influence the situation.

Shoveling and Drilling Contest for Imaim Amohalko Celebration

Another of the annual district shoveling and drilling contests for miners is to be held at Miami, Okla., on July 5, during what is known as Imaim Amohalko week. The last drilling contest was won by Harold Miles, and the last shovelers' contest by James Coonce.

At the Miami celebration it is also planned to have a zinc products parade, and the American Zinc Products Co. has offered a prize of $50 to the firm displaying the most articles made of the zinc sheet they manufacture. "Imaim Amohalko" is not Indian but simply "Miami Oklahoma" spelled backward.

Lost Vein Found in Moscow Mine, Southern Utah

At the Moscow mine, near Milford, in Beaver County, southern Utah, the management, which has been searching for the downward extension of two veins, known as the Back and Silver veins, and that were productive in the past at higher levels, reports cutting the Back vein on the 1,100 level beyond the fault, which cut it off. Two feet of carbonate ore carrying 40 per cent lead and 25 oz. silver has been opened and followed 12 ft., the ore continuing to make both upward and downward, and on the strike of the bed.

Search will be continued on the same level for the Silver vein, which on the upper levels lay a short distance east of the Back vein. On the 1,400 the search for the veins will be speeded up, following the discovery on the 1,100. Sulphide ore is also being followed on the 1,400, and one car of this material, which assayed about 20 per cent lead and 15 oz. silver, has been shipped.

Mohawk Mining Co. Preparing to Sink New Shaft

Working on Pewabic Lode West of Wolverine—First Attempt at Mining in This Section

Trenching has been started on a small scale on the Pewabic lode by the Mohawk Mining Co., in the Michigan copper district, on lands west of the Wolverine property. This work is preliminary to the selection of a site for the sinking of a new shaft. The Pewabic bed outcrops in these lands, options on which were acquired from Wolverine when the Mohawk, Wolverine, and Michigan were consolidated, and the tract also carries the Osceola and Kearsarge amygdaloid lodes and Kearsarge and Calumet conglomerates at depth. All of these veins could be cut by the proposed shaft. The Pewabic bed in these lands lies within 300 ft. of the hanging side of the Greenstone belt and is the farthest vein to the west at this point. The theory is held that the lode breaks into several zones, and it is planned to locate the main portion and follow it.

This is the first time an attempt to mine the Pewabic lode has been made so far north. It has been extensively mined by the Quincy and to a much lesser degree by the Franklin. In trenching so far some copper has been found. Any one of the veins carried by the tract may be found to be commercial.

The Kearsarge lode lies approximately at a depth of 4,000 ft. At the Mohawk branch of the property, preparations are under way to reopen No. 1 shaft, men now being available for this purpose. Production will considerably increase with this unit in operation.

Repairing "B" Norrie Shaft at Ironwood, Mich.

The Republic Iron & Steel Co. has started to repair the shaft formerly known as "B" Norrie, at Ironwood, Mich., on the Gogebic range, but which will now be part of the Townsite mine. An odd situation exists at these properties: The Townsite mine consists of the old Norrie forty, the lease on which was thrown up by the operators of the Norrie, who retained the "A" shaft of the Norrie together with the necessary adjoining surface. This shaft dips at 58 deg., and some distance from the bottom crosses the north boundary of the Norrie forty into property held by the Oliver Iron Mining Co. Part of the plant of the Townsite mine is located on this latter property, and until now its production has come from a shallower vertical shaft located there, but getting the ore from the old Norrie. Most of this ore came from the hanging where the old rooms went up on the dikes. With the reopening of the "B" Norrie shaft, which will be done only to the fourteenth level (1,177 ft.), the old pillars left on the footwall will be scrammed out. None of the old surface plant of the "B" shaft is to be used; electric driven machinery is to be installed to take the place of the old steam-driven equipment that the mine had.

Survey of Petroleum Reserve No. 4, in Alaska, Proceeding Satisfactorily

DISCOVERY of a river about 200 yards wide, about 30 miles from the head of Unakserak River at latitude 67 deg. 45′ 30″ and the mapping of many unknown streams in the northern Alaskan wilderness are some of the results of the exploration of Naval Petroleum Reserve No. 4, now being conducted by Dr. Philip S. Smith and his Geological Survey party, according to messages received by the Geological Survey.

About June 15, the latest report received says, is the date for the probable break-up of the ice in the rivers of the Arctic drainage, which will enable the parties to begin their canoe explorations of 300 or 400 miles, all the dog teams having taken the back trail. From then on the weather will become increasingly warm and even approach the summer heat of a temperate climate, with an entire absence of snow and ice for about two months, with a midnight sun, and with other features that are not generally associated with a polar climate.

Although extensive explorations have already been made to date, the most intensive work will be carried forward from this time on. Every minute will be employed and four months' work, with a sun that never sets, will be crowded into two months.

Easier Labor Situation Helps Copper Range

The Copper Range company, in the Michigan copper district, is producing at the rate of about 2,100,000 lb. of refined copper per month. Labor conditions have considerably improved. The company expects to enlarge its underground force considerably when immigration is again under way.

Due to larger forces and an increase in efficiency in both the Champion and Baltic shafts, mining costs have dropped somewhat since the first of the year. Smelting costs have been cut by the increase in production, but are still a fraction of a cent above normal. Physically, Champion, Baltic, and Trimountain are as good as ever, the newest levels comparing well with the run of rock in levels above. There are poor stretches, but the yield will continue high for many years, as the property is well opened and has much valuable stoping ground.

The present yield per ton is close to 40 lb. of refined copper. The showing in Trimountain, where development work is being carried on, is excellent.

Nevada Rand Mine Ships Another Car of High Grade

Settlement by the Western Ore Purchasing Co. shows the following smelter returns on a 28-ton car of high-grade ore shipped by the Nevada Rand Mines Co., from its property in the Rand district, Mineral County, Nev.: 2.18 oz. gold; 91.50 oz. silver; $104.90 per ton; receipts from smelter, $2,017.01. Several shipments of high grade have recently been made from this mine.

W. V. Rudderow, manager of the company, says that another shipment is now being sampled at Hazen; that the ore is being mined from the east 250 ft. level, where recently a new ore-shoot was opened; that the late shipments have been made from a raise now extended 30 ft. above the 250 level; and that the shipment would represent ore from a winze now sunk 12 ft. below the main 250 ft. level, showing a 3 ft. width of high-grade ore.

Cary Iron Mine Closed at Hurley, Wis.

The Cary mine, near Hurley, Wis., and the oldest Picklands Mather mine on the Gogebic range, has been closed down, and about a hundred men have been discharged. This action is probably due to the unfavorable conditions of prices and demand in the ore market, as the mine itself looks better than it did a few years ago.

Wildcat Drilling for Zinc Ore Near Picher Stopped

The Federal Mining & Smelting Co., which is now the largest single producing company in the Joplin-Miami district, recently announced, through its local manager, P. W. George, the discontinuance of all wildcat drilling operations in the district. For several months the company has been drilling on a tract about four miles west of Picher, where there are no mines. Several good holes were brought in, but no definite bodies of ore could be located. It had also been drilling on a tract near Carl Junction, Kan., and on another near Neosho, Mo., and will abandon all of them for the present.

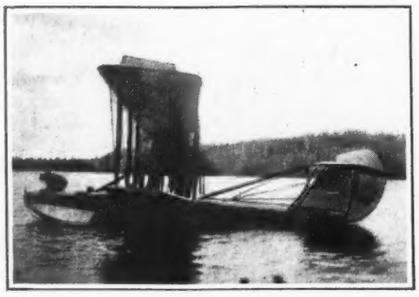
The Federal company continues its curtailment program, entered upon some weeks ago. Its Kansouri and Homestake mines are still down, and the Brewster was down for ten days while repairs were made to the mill, and the Muncie is now idle while the hopper is being rebuilt.

New Plant Will Treat Black Sands

The Philadelphia-British Columbia Mining Co., a Pennsylvania concern, has started to erect a dressing plant, a small smelter, and chemical plant to treat the black sand found on the coast around Masset Inlet, Queen Charlotte Islands, in British Columbia. It purposes to spend $100,000 on the plant that now is being erected on Masset Inlet. It has long been known that the sand contains a small quantity of gold. The company has had a laboratory plant in operation for some time.

Nipissing Takes Men and Supplies to Rouyn by Air

Access to the Rouyn district of northwestern Quebec, where the Nipissing Mining Co. and other operators are engaged in developing claims, was recently made possible through the agency of the Laurentide Airplane Service, Ltd. Previously it had been necessary to go in by boat in summer or dogteam and sleds in winter, the trip taking three days. The same trip now requires forty-five minutes when made by air. Recently the Nipissing Mining Co. turned this new means of communication to good advantage. In the course of development work being done on its claims at Powell Camp, the Nipissing decided to do some sinking that it had not previously planned to do, requiring additional men and supplies. Ordinary communication routes were too slow to meet the emergency, so the new airplane service was resorted to. Ten thousand pounds of supplies and eighteen men were rushed from Haileybury to Angliers. From here the men were sent by plane to Rouyn, five men one day and eleven men the next. Some men preferred the river and fighting flies, mud, and water to the air. The supplies were taken in by two planes hauling 1,000 lb. to the load.



Laurentide Air Service plane leaving Osisko Lake for Haileybury, Ont. Hugh Park, manager of the Nipissing, returning from Powell Camp

The accompanying photograph shows Hugh Park, the new general manager of the Nipissing Mining Co., leaving Osisko Lake for Haileybury in one of the Laurentide Service airplanes.

Tonopah's May Shipments Exceed Last Year's

Bullion shipments from the Tonopah district for May totaled 474,000 oz., with a value of approximately $403,000. Tonopah Extension shipped bullion valued at $205,000, Tonopah Mining Co. $131,000, which included production from the Belmont and some custom ore also, and West End $67,000. This is at a rate above normal since July of last year, and is due in a large extent to the increase in rate of production by the Tonopah Extension since the first of the year.

The Tonopah Mining Co. reports regular development and mining without important changes. Work is being done from three shafts, the Mizpah, Silver Top, and Sandgrass, on various veins. Tonopah Extension continues sinking of the Cash Boy shaft below the 2,100 level, and is carrying on development work on the 1,760, 1,880, 1,940, and 2,000 levels. Development is at the rate of 800 to 1,000 ft. per month. Tonopah Belmont made a larger production during May than for many months, and 3,770 tons of ore was shipped, which yielded 97,350 oz. of bullion. Development for the month totaled 824 ft. and was carried on from the 900, 1,000, 1,100, 1,200, 1,400 and 1,500 levels. Nothing of importance was reported, with regular and normal operations.

West End is mining ore and doing development work from its West End and Ohio shafts from the 400, 500, 555, 800, and 805 levels with normal operations. Work in Tonopah "76" and West End Extension territory is being carried on from the 800 level with normal results from development and nothing new of importance reported.

Several smaller companies are operating and shipments have been made to the mills of the West End and the Tonopah Mining Co.

Mexican Mine Gets New-Type Amalgamator

The Electro-Centrifugal Process Corporation, of Philadelphia, is shipping on order a complete electro-centrifugal amalgamating plant to the Julieta Gold Mines, Ltd., S. A., Estacion Troya, Chihuahua, Mexico. The electrical installation is being furnished by the Hanson & Van Winkle Co., Newark, N. J. It consists of a 300-amp., 5-volt Hanson & Van Winkle low-voltage generator, direct-coupled to a 3-phase 60-cycle 22-volt induction motor. Fine free gold is recovered. D. V. Fennessy, Mills Building, El Paso, Tex., is the consulting electrical engineer of the company.

$50,000 for Zinc Advertising Raised in Tri-State District

Success of Campaign Attributed to Bendelari

THE campaign to raise $50,000 in the Joplin-Miami zinc-lead district to be used by the American Zinc Institute in a $100,000 advertising campaign for zinc, particularly for galvanizing, was brought to a successful close on June 12, when final reports of the workers on the project showed that $50,253.50 had been pledged.

Pledges from the different towns and camps of the district were as follows: Joplin, $14,932; Baxter Springs, $6,755; Picher, $4,450; Miami, $4,170; Galena, $707.50; Webb City, $670; Cardin, $400; Treece, $400; Columbus, $252.50; Hockerville, $170; Douthat, $150; Commerce, $146; Quapaw, $50; and the Operators' Association, $17,000.

Success of the campaign is considered here as a feather in the cap of Arthur E. Bendelari, new president of the Zinc Institute.

Candelaria Reorganization Fails

It appears that the plan for the reorganization and refinancing of the Candelaria Mines Co., to provide funds for resuming operations at the mine, has been unsuccessful. The new corporation, the Reorganized Candelaria Mines Co., failed to take up its option on the $400,000 mortgage on the Candelaria Mines property, held by the Rochester Silver Corporation, for $150,000. The option expired June 2.

Tax Gatherers True to Form in Kansas

Zinc-ore producers of the Kansas section of the Joplin-Miami district are strongly protesting the arbitrary increase in assessments of mining properties made by the county for taxation purposes. The commissioners of Cherokee County doubled the assessment of all plants.

Numerous instances of what are termed outrageous assessments are being reported. The Vinegar Hill Zinc Co.'s plant had been assessed at $41,000, and it is now double that figure. The Commonwealth mill was valued at $25,000 and it has been raised to $50,000.

A hearing was given the protesting zinc men at Columbus on June 10, and the county commissioners took the matter under advisement. It is believed they will give relief.

Days Take Over Operation of Western Union

A new board of directors and officers was recently elected by the Western Union Mining Co. Harry L. Day was named president and general manager; Jerome J. Day, vice-president; Walter E. Heitfield, secretary-treasurer, and the directors chosen follow: L. W. Hutton, Frank M. Rothrock, and August Paulsen, all of Spokane; Matt H. Sullivan, Kellogg, and Herman J. Rossi, of Wallace. Harry L. Day, representing the Hercules company, says that the Western Union is not yet a mine, but an attractive prospect.

Another Premier Dividend Expected

The Premier Gold Mining Co., operating near Stewart, B. C., is reported in Spokane to have struck an orebody 40 ft. wide on its No. 6 or deep tunnel level. The average value is said to be $30 per ton in gold and silver. A dividend of $400,000 or 8c. a share on the issue of 5,000,000 shares will be disbursed on July 5, according to an unofficial report. This will increase the total of disbursements to $5,688,000, of which $1,738,000 was made in 1923. The profits of operation in the first four months of 1924 were $815,000 before a deduction for depletion.

Arkansas Manganese Shipments Increasing

Shipments of manganese from the Batesville, Ark., field are increasing. The average is now eight cars weekly, running about 42 per cent metallic manganese.

Highland Consolidated to Resume Operations

William Maxwell, State Mine Inspector of Montana, who is also president of the Highland Consolidated Co., says that operations will be resumed on the property this summer. A tunnel several hundred feet long will be driven until a total length of 900 ft. has been attained, at which point several known veins should have been cut. The tunnel will be driven through the Leggat and Warren claims, both old-time gold producers in the Highland Mountains, which are about 25 miles south of the Butte district.

Alaska Juneau May Tonnage Over Quarter Million

Alaska Juneau mined and delivered 231,500 tons to the mill in May, 1924. Total recovery was $137,000—59.16c. per ton; operating expenditures were $122,400—52.86c. per ton, and operating profit was $14,600, or 6.30c. per ton. Other expenditures were $12,000 on capital account, $2,000 on Ebner mine, and $15,475 on interest account, leaving a deficit of $14,875 for the month.

A mine accident resulting from the accumulation of water in an ore chute has temporarily interrupted the tramming of ore from the south side of the mine. Service from this part of the mine will be resumed soon.

Orleans Hornsilver to Produce Again Soon

The Orleans Hornsilver, at Hornsilver, Nev., out from Goldfield, controlled by the Victory Divide Mining Co., is about to break into the ranks of the producers again. There has long been a developed tonnage of ore of a grade which will pay, but the present holders of the option were unable to ship on account of the terms of their option, and had no mill. Their present intention is to ship about 5,000 tons of ore at the rate of around two cars per week. This ore is reported to average more than $25 per ton. It is hauled to Stonewall siding, a distance of 16 miles, by trucks and then shipped to the mill of the Tonopah Mining Co.

Pabst Power House Capacity Now 20,000 Hp.

The third 4,000 kva. steam turbogenerator in the power house of the Pabst mine, at Ironwood, Mich., on the Gogebic range, has been started up and put under load. This brings the capacity of the plant up to 20,000 hp.

Ore Shipments from Cobalt 1,107 Tons in May

Six companies shipped silver ore in May from the Cobalt district, in Ontario. In all 1,107 tons was shipped by the following producers: Coniagas, 85 tons; Genesee, 41; the Mining Corporation, 609; McKinley-Darragh, 43; Nipissing 148; and O'Brien, 180. The ore was consigned as follows: 762 tons to the Deloro Smelting & Refining Co.; 149 tons to Quebec; and 196 tons to the American Smelting & Refining Co. at Perth Amboy.

Labor Abundant, Castile Company Now Sinking Shaft Itself

THE Castile Mining Co., of Ramsay, Mich., has taken over the work of sinking its new shaft at the Eureka mine from the contractors, the Foundation Co. This action was provided for in the contract, which was on a cost-plus basis.

Because of labor shortage last year the mining company gave the contract to the Foundation Co. with the understanding that it bring in a crew from outside the district. The latter company, however, was not successful in getting a crew of miners for the regular shaft sinking below the drop shaft, and so the work was delayed. Now with an abundance of local labor the Castile company should have no difficulty in carrying on the work without the assistance of the contractors.

Silver Conference on Aug 11 Likely at Salt Lake

The conference of silver producers probably will be reconvened on Aug. 11, at Salt Lake City, Utah. In response to a telegram from W. Mont Ferry, the chairman of the conference, Senator Oddie, chairman of the Senate Commission of Gold and Silver Inquiry, has advised that this date is entirely satisfactory to the commission.

At the conference held in Reno, Sept. 4, last year, it was decided to reconvene the conference after studies had been made of the difficulties which would have to be surmounted in the establishment of a silver export association, and of other problems of the industry.

One of the factors operating to maintain the price of silver, information reaching the Senate Commission shows, is the demand from various countries in which the minting of additional silver coins has been ordered.

Work Progressing at Rimini, Mont.

The Rimini district is showing more activity at present than it has for years. Development work is progressing favorably on the lead-arsenic property under the management of C. W. Geddes. Plans are being made for the construction of a mill, which will be started in the near future as soon as all the necessary arrangements have been properly completed.

E. A. Morley, president of the Red Mountain Hydraulic Placer Co., reports that a favorable season is expected, owing to the ample water storage provided last fall and the many other improvements made this year. A large force of men are working on the property under the supervision of Charles E. Hewitt.

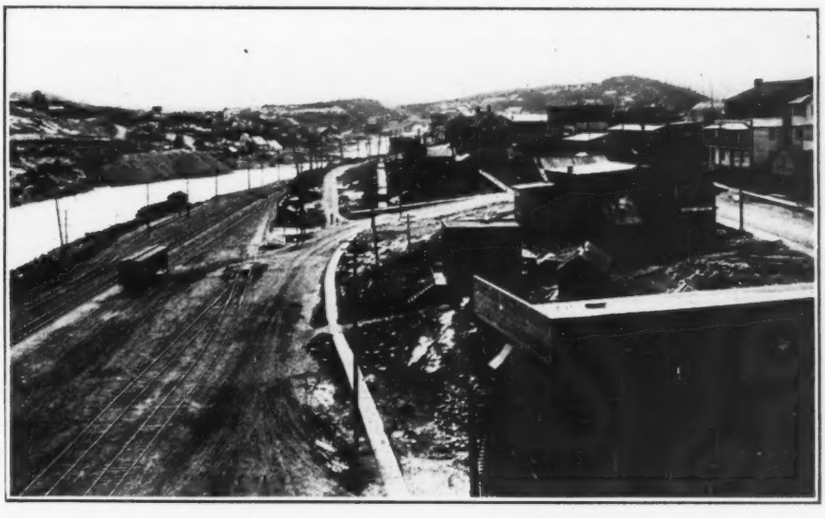
Sneath & Clay Mine, in Nevada City, Reopened

The Sneath & Clay mine, just south of Nevada City, Calif., has been acquired by the newly organized Camborne & Hale Mining Co., and will be reopened by C. E. Trezona and W. H. Martin. The property was opened to a depth of 350 ft. in 1865 and was unwatered again in 1897. Since that time it has been idle. The new company will unwater the shaft and sink it deeper and develop the vein.

Butte & Superior Report

The Butte & Superior Mining Co. showed an operating profit of $102,947 in the first quarter of 1924. Depreciation and taxes reduced this to a net profit of $21,580. These earnings are equivalent to 8c. a share on 290,197 shares.

The company mined 86,772 tons of zinc ore, averaging 10.793 per cent zinc and 3.77 oz. of silver to the ton, and 44,275 tons of copper ore, averaging 3.84 per cent copper and 5.75 oz. of silver to the ton. The zinc ore produced 18,739,003 lb. of zinc and 327,331 oz. of silver, and the copper ore produced 3,394,660 lb. of copper and 254,721 oz. of silver.



Cobalt, Ont., as seen from the town hall

Mining Plank in Republican Platform Oddie's Work

As Adopted, Is Little Like Original, However—Smoot's Opposition Puzzling

AN acknowledgment that mining, along with agriculture, is a fundamental industry was wrung from the Republican platform makers by Senator Oddie, of Nevada. The platform reference to mining is meager and a part of it is an unfounded boast, but the fact that the representatives of the party, in national convention assembled, formally approved a declaration pledging the party to efforts to improve the situation in this "great fundamental industry" promises to be of much value, it is believed, in view of possible railroad rate reductions on the products of fundamental industries.

The mining plank as it appears in the platform bears little semblance to the one proposed by Senator Oddie. Realizing the need for brevity, he suggested at the public hearing of the resolutions committee at Cleveland, that since the depression in mining has been so much like that which has overtaken agriculture, it would prevent repetition were the mining plank to follow immediately after that on agriculture. Then by the simple statement that "much of the foregoing applies with equal force to the mining industry," repetition would have been avoided and space saved. This suggestion did not, however, meet the approval of the committee, nor did Senator Oddie's perfectly truthful statement that "under this administration an exhaustive study was begun and in being pushed to a conclusion to determine what steps may be taken to improve the condition of the producers of the metalliferous minerals." Instead of this well-deserved recognition of the work of the Senate Commission on Gold and Silver Inquiry, the platform makers say that "this administration has accomplished much" for mining—a statement with which many will take issue.

The principal opposition to a real mining plank seems to have come from Senator Smoot, of Utah. Western delegates to the convention were at a loss to understand his attitude, because mining is such an important activity in his own state.

New War Mineral Awards Made, Legal Limitation Removed

Acting under authority of an act of Congress approved June 7, 1924, removing the limitation in the original law, the Department of the Interior has authorized the payment of forty-nine war minerals claims in amounts ranging from $110 to $48,000 and the claims now go to the Treasury Department for payment. The claimants and the amounts awarded follow by states:

Arkansas

Adams & Schell, Batesville, $296.71.

California

D. McDonald, Livermore, $1,245.35.
H. M. Parsons, *et al.*, South Pasadena, $2,562.36.
R. A. Dallugge, Los Angeles, $786.87.
John Barandum & Son, Callahan, $315.
H. A. Houser, *et al.*, Los Angeles, $2,456.63.
Lon Sargent, Fort Jones, $150.
J. F. McKnight, Eureka, $900.
William Wortell, Towle, $222.82.
Pine Creek Tung. Company, Los Angeles, $48,748.14.
Smith & Smith, Bishop, $360.
O. O. Scripture, Chinese Camp, $284.80.
Harris & Harris, Etna Mills, $496.
D. Williams, Callahan, $551.36.
B. Moscatelli, Nevada City, $288.09.
Young, Milne & Reichman, Fort Jones, $501.
G. J. Masterson, Callahan, $114.25.
A. E. Englebright, Selby, $884.05.
J. A. Nichols, Weed, $951.96.
H. M. Parsons, *et al.*, South Pasadena, $4,742.66.
Walsh & Farmer, Auburn, $691.18.
James J. Donohue, Tuolumne, $1,965.63.

Colorado

Charles A. Shreve, Denver, $967.95.
Frank Johnston, Boulder, $1,199.80.
J. B. Rowley, Eldora, $463.90.
M. N. McInnis, Leadville, $6,134.14.
Sullivan & Kelly, Eldora, $1,530.31.

Delaware

National Minerals Company, Wilmington, $8,810.13.

Missouri

Lincoln Manganese Co., Joplin, $1,078.92.
McClure & Williams, Joplin, $398.
H. U. Dale, Joplin, $338.

Montana

Fred Kroger, Philipsburg, $110.

Nevada

Albert Loose, Lovelock, $1,129.30.

New Mexico

New Star Mn. Mine, Derry, $1,444.09.
Bourbonia & Saunders, Rincon, $992.25.

Oregon

George Roba, Paulina, $520.
H. T. Lyon, Canyon City, $485.
F. C. Tornow, Portland, $2,773.32.
P. Delore & G. Delore, Suplee, $2,934.98.
W. H. Prose, John Day, $427.20.
Black Bess Creek Association, Coquille, $312.79.
L. Shelby, Dayville, $1,150.
Bailey Hunter Chrome Co., Baker, $594.96.

Pennsylvania

Jehu Wood, Jr., Philadelphia, $392.40.
Manganese Mines Steel Co., Philadelphia, $2,172.83.

Tennessee

L. L. McQueen, Butler, $1,481.25.

Texas

Walter Mayfield, Valentine, $408.

Utah

James T. O'Connor, Lynndyl, $915.50.

Virginia

J. D. Perry, North Tazewell, $3,940.84.

Hearing on Oil Claims in Alaska Held in Washington

An oral hearing at the Interior Department, Washington, D. C., was set for June 20, on the question of the legality of a score or more of mineral claims involving lands in the Chugach National Forest, in Alaska.

The claimants are the Alaska Coal Oil Co. and the Alaska Consolidated Oil Fields, which bought up the claims from persons who filed mineral applications on the lands at the local land office at Anchorage, Alaska, a number of years ago. These applications have been rejected at the General Land Office, and the Department of Agriculture, controlling the Chugach National Forest, has protested.

London Letter

By W. A. Doman

Special Correspondent

Development of Cordoba Copper —Cam & Motor Uncovers Good Orebody—Waihi May Come Back

London, June 3, 1924—At the annual general meeting of the Cordoba Copper Co. a pleasing story was told concerning the developments on its 20 square miles of territory in the Singhbhum copper field, Chota Nagpur, India. In the Mosaboni mine a highly mineralized deposit is being opened. Several shafts have been sunk. In the No. 7 shaft section the No. 2 level for 508 ft. has averaged 51 in. in width and 4.1 per cent copper. No. 9 shaft was sunk 106 ft. on a lode averaging 5.27 per cent copper, over a width of 47 in. The No. 2 level for 50 ft. averages 45 in. in width and 3.85 per cent in value. The territory covers 8 miles along the copper belt, and the lodes have been proved by underground workings for 3,700 ft. and to depths of 490 ft. at No. 3 shaft and 375 ft. at No. 7 shaft. At Dec. 31 the ore reserves were 105,225 tons of 3.1 per cent copper; since that date 35,760 tons have been added, carrying 4.75 per cent. Further capital is required for additional development and for plant and machinery. The directors expect that Indian consumers will buy all the metal produced.

The Cam & Motor Gold Mining Co. (Rhodesia) is again in the limelight. In the 14th level of the Motor at 528 ft. south of the main shaft a crosscut has proved 11¾ ft. of lode averaging 127s. At 15 ft. further south a second crosscut has proved about 14 ft. of an average value of 155s. Visible gold occurs in each crosscut. In the level above are the high values previously reported, some of which were 125s. over 55 in.; 227s. over 58 in.; 221s. over 69 in.; 281s. over 67 in.; 600s. over 56 in.; 482s. 6d. over 58 in.; 568s. over 58 in. and 305s. over 52 in.

Dr. Malcolm Maclaren has been engaged by the Gold Fields Rhodesian Development Co. to proceed to Rhodesia for the purpose of making a thorough examination of the company's interests in that country. The company has a number of promising properties under option, and desires to know which of them offer the greatest opportunity for further development.

An unofficial cable dispatch from New Zealand states that ore of good gold content is being opened up in the lower levels of the old Waihi mine. The statement is rather vague, as the mine contains so many lodes and it is difficult to discover exactly where the improvement is taking place. The main gold carrier in the past has been the Martha lode, and, according to recent information, this has given rather better assays—something like 50s. over 6 or 8 ft. The different lodes vary considerably in width, and from the standpoint of ore there seems an almost unlimited quantity, but much of it assays less than 20s. per ton. The Waihi was at one time regarded as an investment for widows and orphans.

Men You Should Know About

H. L. Venables has left Oruro, Bolivia, and will be in London for a few months.

Sidney Paige is in Montana engaged in geological work in the Bearpaw Mountain area.

Arthur B. Parsons

Arthur B. Parsons, assistant editor, *Mining Journal-Press*, is making a field trip through Colorado, Utah, and the Pacific Northwest.

Morton Webber sailed for Europe on the "Aquitania," June 18 to be gone about two months.

Arthur W. Jenks is in the northern part of the Province of Quebec, but will soon return to New York.

S. R. Capps is en route to Alaska, where he will make geologic surveys in the Matanuska region.

George A. Packard, of Boston, mining engineer and metallurgist, is making a field trip to Jalisco, Mexico.

Ludwig Vogelstein, chairman of the board of the American Metal Co., sailed for Europe on the "Leviathan," on June 7.

F. W. Batchelder has been elected a director of United States Smelting, Refining & Mining Co., succeeding **E. V. R. Thayer**, whose term had expired.

H. E. Davis, mining engineer, of Los Angeles, recently made a field trip in the course of which he inspected the Richmond, Silversmith, and other properties in the Coeur d'Alene district.

J. M. Callow, president of The General Engineering Company, is at the Salt Lake City headquarters of that company. He expects to remain at Salt Lake until some time in July.

A. W. Newberry, mining engineer, of New York, arrived at San Francisco on June 23 from Australia, having been absent from New York on a hunting expedition in South Africa since last August.

R. I. Reynolds, superintendent of the Trimountain mine of the Copper Range Co., in the Michigan copper district, has resigned and left for Burlington, Vt, where he has accepted a position with the Champlain Valley Lime Co.

O. R. Whitaker, of Denver, and **C. Q. Schlereth**, of New York, mining engineers, have just returned to the United States from a two months' examination of properties in the western part of the State of Chihuahua, Mexico.

Vincent P. Gianella, mining engineer, of Reno, Nev., has just returned from a trip to the southern part of Nevada, during which he made an inspection of the properties of the Pittsburgh Silver Peak Gold Mining Co., situated at Silver Peak, Nev.

Dr. George Otis Smith, director of the U. S. Geological Survey, sailed on June 20 for London, where he will represent the Secretary of the Interior at the World Power Conference. During Dr. Smith's absence, **W. C. Mendenhall** will act as director.

Anthony Jenkin, associate professor of mining engineering, is in charge of the sophomore miners of the Case School of Applied Science, Cleveland, Ohio, who are taking the practice term in mine surveying at the mine of the Grant Coal Co., Salineville, Ohio.

Edward H. Denny arrived in Denver on June 12, to succeed **Daniel Harrington** as district mining engineer of the U. S. Bureau of Mines for Colorado, Wyoming, and New Mexico. Mr. Harrington goes to Salt Lake to enter private practice as a consulting engineer.

W. L. Saunders, president of the Ingersoll Rand Co.; **H. N. Spicer**, of The Dorr Company; and **H. W. Hardinge**, of the Hardinge Co. Inc., sailed in the Cunarder "Scythia," on June 18, to attend the World Power Conference to be held in connection with the British Empire Exposition at Wembly.

Edwin Lang Miller, of Buffalo, N. Y., vice-president of the Wright-Hargreaves Mines, Ltd., has returned to that city after an extended tour to the company's gold mining properties at Kirkland Lake, Ontario. He reports the company has work under way on an extension to its mill which will double the present capacity of the plant.

Obituary

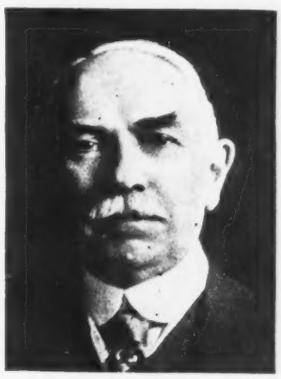
Horace Monroe Swetland

Horace Monroe Swetland, president of the United Publishers Corporation, which publishes *Iron Age* and other important business magazines, died at his home in Upper Montclair, N. J., on June 15, 1924. Death was caused by pneumonia. Mr. Swetland was born in Chautauqua County, N. Y., in 1853. At seventeen he was a teacher in the public schools. In 1881 he came to New York as a reporter, subscription solicitor, and advertising solicitor of the *Boston Journal of Commerce*. Three years thereafter he became Boston representative of *Power*, later coming to New York and assuming the management of that publication. Mr. Swetland purchased *Power* in 1888 and sold that magazine to the late John A. Hill in 1900. At one time he was the owner of *Engineering and Mining Journal*, as the paper was then called.

In 1911 Mr. Swetland organized the United Publishers Corporation, which brought together publications in the iron and steel, automotive, and building fields. He was elected president of that corporation and retained that office to the time of his death. He was also president of the National Publishers Association, the Class Journal Co., the Federal Printing Co., the U. P. C. Realty Co., and the Swetland Realty Co., and a director of the Commercial Trust Co.

Mr. Swetland was a lifelong friend of James H. McGraw, president of the McGraw-Hill Co., Inc. They had been associated socially and in business for forty-six years. Mr. McGraw has said, commenting on Mr. Swetland's death:

"Mr. Swetland's success as a man and a publisher was due to a rare combination of personal qualities and business acumen. He was a tireless worker, had great penetration, concentration, and perseverance; he was an organizer of the first rank, and was always a co-operator. His ideals in publishing were high, service to the readers of his publications being his first consideration. The publishing business has lost an outstanding figure in the passing of Horace M. Swetland, but his work will endure in the great institutions to



Horace Monroe Swetland

which he gave unstinted devotion, and in the lives of those whom he trained in the technique of publishing and encouraged to make the best of their opportunities."

Mr. Swetland not alone won for himself marked distinction in American technical journalism and in those industries which his papers served, but—what he prized more—the high regard and respect of all his very wide circle of associates, business and social. To these his passing brings a keen regret. He is survived by his widow, Mrs. Clara A. Swetland, and four children. Funeral services were held at his home on June 17, and interment was in Fredonia, N. Y., the day following.

James MacGregor, who retired from the position of Chief Inspector of Mines for British Columbia a few years ago, because of his advanced years, died at his home in Victoria on May 28.

Recent Technical Publications

Reviews, Abstracts, and References

Metal Statistics

Yearbook of the American Bureau of Metal Statistics. Fourth annual issue, 1923. Published at 115 Broadway, New York City. Price $2.

This résumé has the merit of being timely, accurate, and compact. Timeliness in the publication of any statistical matter adds immensely to its usefulness. A pleasant feature of the book is the absence of that intimate mixture of text and advertising matter which detracts from the presentation of several other statistical publications. Students of metal statistics will find detailed figures through 1923, giving production, consumption, imports, exports, and prices of various metals for a period of years. In view of the large amount of material gathered between the covers of this book it is pardonable to find a slight error in one of the tables. We would suggest that the gold production of the Transvaal for 1920 be changed from 8,331,651 oz. to 8,158,455 oz. in the next edition. The book itself is one of the most valuable reference works at the disposal of the metal statistician and others who may be interested in the subject covered.

Use of Electricity in Mines. Colliery Electrical Engineering. By G. M. Harvey. Isaac Pitman & Sons, London and New York. Price $4.50.

Relatively few books deal exclusively with the application of electricity in mining operations, so that, although this volume applies primarily to British colliery conditions, it should be useful to mining superintendents and electricians generally. Hoisting, pumping, ventilation, and underground transportation are the same in principle in both coal and metal mines. The book is largely elementary. It is well illustrated. However, the apparatus described has been manufactured for British use and therefore differs somewhat from that used in America.

The subject is divided into several chapters, beginning with a discussion of the generating plant, describing surface installation and underground plant, and finally, details of administration.

Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec. Memoir No. 136. Geological Survey of Canada, Ottawa, 1924. Obtainable on request.

A general geological report on the regions of Ontario and Quebec designated. Geological formations belong to the pre-Cambrian and the Paleozoic periods. The principal economic mineral is molybdenite (page 63), of which, in 1918, 377,850 lb., to the value of $434,528, was produced. The ores are pegmatitic (magmatic) segregations in intrusive syenite of pre-Cambrian age. Galena occurs principally at the Kingdon mine, in a vein occupying a fault fissure. This mine has been in continuous operation since 1914. The vein cuts across Grenville limestone and its inclusions of igneous rock. This and other galena-calcite veins are post-Ordovician. J. E. S.

Mine Accidents—Technical Paper 354 of the U. S. Bureau of Mines, Washington, D. C., 72 pages, is a statistical report on metal-mine accidents in the United States during the calendar year 1922, by William W. Adams. The injury rate represents a slight and perhaps insignificant increase over that of 1921, but the fatality rate is somewhat higher, largely because of the disastrous Argonaut fire in California, which killed forty-seven men. The paper is obtainable free from the Bureau as long as the supply lasts; thereafter for 10c. from the Superintendent of Documents, Washington, D. C.

Vermont Geology—The Report of the State Geologist on the mineral industries and geology of Vermont, 1921-1922, has recently been issued as a book of 342 pages. It may be obtained on request.

Canadian Resources—The Natural Resources and Intelligence Service, Canadian Department of the Interior, Ottawa, Canada, has issued an attractive 221-page book on "Canada: Natural Resources and Commerce," illustrated with numerous halftones and two colored maps of the country. One chapter is devoted to minerals and mining. The book is designed to appeal to those who are thinking of settling or going into business in the country and will be forwarded to any one interested without charge.

Riddle, Oregon—The U. S. Geological Survey, Washington, D. C., has published a folio, No. 218 of the geologic atlas of the United States, describing the Riddle quadrangle in southwestern Oregon. J. S. Diller and G. F. Kay are the authors. It may be obtained for 25c. from the Survey.

Geology—The *Bulletin* of the Institution of Mining and Metallurgy, for November, 1923, contains two papers of interest to geologists. One discusses "The Underground Geology of the Kolar Gold Field," by Thomas Pryor, 21 pages with plates, and the other "The Tectonic Geology of the Sulitjelma Pyrite Deposits in Relation to Their Genesis," 11 pages, by D. W. Bishopp. Either paper may be obtained for 1s. from the offices of the Institution, Cleveland House, 225 City Road, London, E. C. 1, England.

Metallurgy of Zinc—Bulletin No. 14 of the Department of Metallurgical Research, Utah Engineering Experiment Station, Salt Lake City, Utah (though no address is given anywhere in the bulletin), contains an interesting paper on "Possibilities in the Hydrometallurgy of Oxidized Zinc Ores," by C. G. Maier, G. L. Oldright, and G. W. Kuerner. The second part of this paper will be of particular interest to miners, as it discusses the oxidized ores available in the Rocky Mountain states. There is also a short paper by C. E. Baumgarten and C. G. Maier on "The Reaction Between Zinc Oxide and Oxygen." The bulletin may presumably be obtained on request.

Flotation of Sulphur—"Flotation Experiments on a Utah Sulphur Ore" are described by H. C. Sherman in a 9-page paper in Bulletin No. 14, mentioned in the preceding paragraph. This ore contains elemental sulphur, and flotation was made to yield a 90 per cent concentrate with 80 per cent recovery. Many reagents were tested.

Corrosion From Mine Water—Bulletin No. 6 of the Coal Mining Investigations of the Carnegie Institute of Technology, Pittsburgh, Pa., pp. 61, price 40c., describes "Accelerated Corrosion Testing of Metals and Alloys in Acid Mine Water."

Australian Lead Smelting—"Lead Smelting at Sulphide Corporation, Ltd.'s Cockle Creek Works," 15 pages, by H. A. Evans, was published in the *Proceedings* of the Australian Institute of Mining and Metallurgy, Melbourne, for Sept. 30, 1923. This is not a detailed description of the plant, but merely a discussion of some of the practices and conditions peculiar to these works.

Canadian Engineers—The February *Bulletin* of the Canadian Institute of Mining and Metallurgy, 603 Drummond Building, Montreal, price 50c., contains the membership list. It is not arranged by provinces this year and is therefore handier for reference.

Blasting Practice—"Breaking Ground at the Copper Queen Mine," 4 pages, by Gerald Sherman, in *The Explosives Engineer* for January (Wilmington, Del.; price 25c.), covers details of drilling and blasting at that property. A further short article in this issue proves that the force of exploding dynamite acts equally in all directions, and not chiefly downward as is sometimes asserted. "Blasting in Swiss Tunnels" is described in an article by Dr. Alfred Stettbacher translated by Kurt Wassen.

Mineral Resources—Recent publications of the U. S. Geological Survey, Washington, D. C., in the "Mineral Resources" series, include: "Feldspar in 1922," by Frank J. Katz, pp. 9; "Gold, Silver, Copper, Lead, and Zinc in Utah in 1922," by V. C. Heikes, pp. 26; "Gold, Silver, Copper, Lead, and Zinc in California and Oregon in 1922," by James M. Hill, pp. 47; "Gold, Silver, Copper, Lead, and Zinc in Montana in 1922," by C. N. Gerry, pp. 36; "Gold, Silver, Copper, Lead, and Zinc in Arizona in 1922," by V. C. Heikes, pp. 30; "Carbon Black Produced from Natural Gas in 1922," by G. B. Richardson, pp. 2; "Stone in 1922," by G. F. Loughlin and A. T. Coons, pp. 84; "Sulphur and Pyrites in 1923," by H. M. Meyer, pp. 6 (our congratulations on this prompt publication); "Natural-gas Gasoline in 1922," by G. B. Richardson, pp. 5; and "Natural Gas in 1922," by G. B. Richardson, pp. 6. Any of these are obtainable on request from the Survey.

Australia—The Official Year Book of the Commonwealth of Australia, No. 16—1923, 1,122 pages—has been issued by the Commonwealth Bureau of Census and Statistics, Melbourne. One chapter, of 45 pages, is devoted to the mineral industry, with statistics through the year 1921.

Alaskan Mining—Bulletin 755-A of the U. S. Geological Survey, Washington, D. C., 56 pages, obtainable on request, is entitled "The Alaskan Mining Industry in 1922," by Alfred H. Brooks and Stephen R. Capps. A selected bibliography on Alaska is appended.

Smoke Abatement—Technical Paper 273 of the U. S. Bureau of Mines, Washington, D. C., 30 pages, obtainable on request, is by Osborn Monnett and is entitled "Smoke Abatement." Special attention is given to domestic and industrial coal smoke problems, locomotive smoke, and smoke ordinances.

Mercurial Poisoning—A leaflet of 13 pages on "Mercurial Poisoning," by J. A. Turner, has been issued as Reprint No. 903 from the Public Health Reports, by the United States Public Health Service, Washington, D. C., obtainable on request. Methods of determining the amount of mercury vapor present in air are given.

Mineral Statistics — The following booklets of statistics containing world's production, imports, exports, and prices for 1919 to 1921, have been issued by the Imperial Mineral Resources Bureau: "Molybdenum," 8 pages, price 6½d., and "Vanadium," 5 pages, price 6½d. obtainable from H. M. Stationery office, London.

A.I.M.E. — Volume LXIX of the Transactions of the American Institute of Mining and Metallurgical Engineers, New York, has recently been issued. Its 1,339 pages contain the papers and discussions presented at the New York meeting in February, 1923, and at the Canadian meeting, in August, 1923.

Tri-State Zinc Field—In *The Explosives Engineer* for April (Wilmington, Del.; price 25c.) is a 6-page illustrated article by Theodore Marvin on "The World's Greatest Zinc Field," which describes Tri-State mining methods.

Economic Geology—*Economic Geology* for April-May (Lancaster, Pa.; price 65c.) contains the following articles: "The Tin Deposits of Chacaltaya, Bolivia," by Waldemar Lindgren, pp. 6; "Apparatus for Measurement of Temperatures in Deep Wells," by C. E. Van Ostrand, pp. 20; "Recent Progress With Leached Ore Capping," by H. S. Morse and Augustus Locke, pp. 10; "The Gypsum Deposits of Southwestern Persia." by J. V. Harrison, pp. 14; and "Ore Deposition at the Creighton Mine, Sudbury, Ont.," by J. E. Spurr, pp. 6.

Patents

Chloridizing Ores — No. 1,496,879. June 10, 1924. J. H. Hirt, El Paso, Tex., assignor to Mexican Northern Mining & Ry. Co. A method of chloridizing ores by which the ore and salt mixture is subjected to the direct heating action of hot gases in which there is substantially no free oxygen.

Concentrator — No. 1,497,176. June 10, 1924. Elmer James, Provo, Utah. A revolving cylindrical apparatus, the inner surface of the shell being riffled, adapted to concentrate ores.

No. 1,497,658. June 10, 1924. C. N. Bielenberg and A. E. Robinson, Deer Lodge, Mont. An elongated box with equipment for shaking it laterally, and water jets disposed so as to concentrate the heavy particles in an ore pulp.

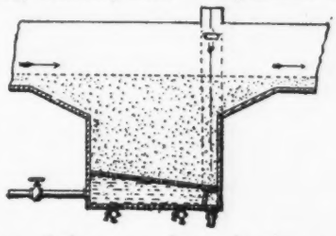
Gold Dredge—No. 1,497,360. June 10, 1924. C. B. Dawson and C. B. Dawson, Jr., Seattle, Wash. A spiral scraper and shore connections for dredging gold placer ground.

Rock Drill—No. 1,494,030. May 13, 1924. F. M. Slater, Easton, Pa., assignor to Ingersoll-Rand Co., Jersey City, N. J. An impulse-actuated fluid pressure rock drill of the hammer type.

Roasting Furnace — No. 1,494,031. May 13, 1924. M. G. F. Sohnlein, Santiago, Chile, assignor to Allis-Chalmers Mfg. Co., Milwaukee. Method of constructing hearths and handling material in a multiple-hearth furnace.

Amalgamator—No. 1,494,071. May 13, 1924. S. J. Marsh, Spokane, Wash. A process of recovering rare metals occurring in the native state in black sand and electrolytically plating the metallic particles and subsequent amalgamation.

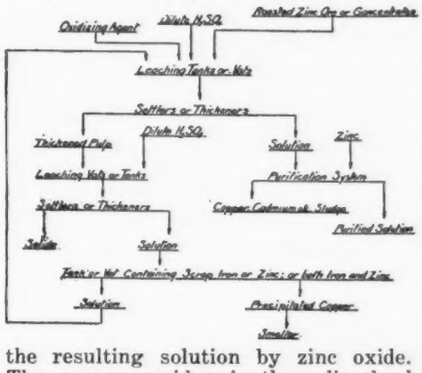
Hydraulic Classifier—No. 1,490,420. April 15, 1924. R. B. Elder, Unsankinko, Chosen, Japan, assignor to A. D. Elder, Denver, Colo. A hydraulic classifier of the type shown in the accompanying drawing.



No. 1,491,296. April 22, 1924. Antoine France, Liége, Belgium. Fine particles of minerals are separated according to their specific gravity by stratification in a flowing stream of water, the particles of high specific gravity being settled in a quiescent body of liquid of high specific gravity.

No. 1,495,869. May 27, 1924. Alberto Noriega, New York City. A new form of cone classifier, using conical deflector plates and multiple discharge ports.

Electrolytic Zinc — No. 1,496,004. June 3, 1924. Frederick Laist, Anaconda, and J. O. Elton, Great Falls, Mont., assignors to Anaconda Copper Mining Co., Anaconda, Mont. A process for preparing zinc sulphate solutions free from arsenic, antimony, and copper. The ore is leached with dilute sulphuric acid; the iron precipitated, thereby eliminating arsenic and antimony; and the copper precipitated from the resulting solution by zinc oxide. The copper residue is then dissolved with sulphuric acid and reprecipitated.



Refractory — No. 1,492,685. May 6, 1924. E. W. Hale, Greenwich, Conn. Use of an alloy containing chromium, made into the form of bricks, as a refractory lining for metallurgical furnaces.

Sponge Iron—No. 1,492,818. May 6, 1924. E. B. Thornhill, Hurley, N. M. Iron ore is mixed with a reducing agent and passed through a carbon-lined retort externally heated. The reduced sponge iron is cooled in a non-oxidizing atmosphere, and separated from the other material of the charge.

Flotation Reagent — No. 1,492,904. May 6, 1924. H. L. Sulman, London, and Edwin Edser, Brockley, London, assignors to Minerals Separation North American Corporation, New York. The use of a soluble fatty-acid soap for the flotation of oxidized ores.

No. 1,497,310. June 10, 1924. Stanley Tucker, London, and Edwin Edser, Brockley, London, assignors as above. The patent covers the use of a flotation agent which is a reaction product between substances containing a soap-forming acid radical, an alkaline radical, and a sulphide radical.

Flotation Machine — No. 1,492,933. May 6, 1924. J. B. Parker, Kellogg, Idaho. A flotation machine of the horizontal drum type.

Rotary Core Drill — No. 1,493,112. May 6, 1924. J. E. Elliott, Los Angeles. Design of a rotary core drill with a tubular shank and core receiving bore.

Zinc Smelting—No. 1,493,992. May 13, 1924. Heinrich Koppers, Essen-Ruhr, Germany, assignor to the Koppers Development Corporation, Pittsburgh, Pa. A method of distilling zinc and other volatile metals from their ores, consisting in making briquettes of the ore, which are stacked in an oven and surrounded with carbon bricks.

No. 1,493,993 issued and assigned as above. A two-stage distillation process in the first stage of which the charge is heated to a temperature lower than that at which the metal will distill. The distillation products are removed, and a second treatment is given to drive off the metal.

No. 1,497,595. June 10, 1924. A. P. Schonaerts, Fort Smith, Ark. A kiln for preheating green retorts used in zinc smelting.

Crusher — No. 1,493,998. May 13, 1924. C. S. Lincoln, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co., Milwaukee. Design for a gyratory crusher.

No. 1,494,036. May 13, 1924. F. J. Straub, New Kensington, Pa., assignor to Crozier-Straub, Inc., New York City. Design for the rolls of a roll crusher.

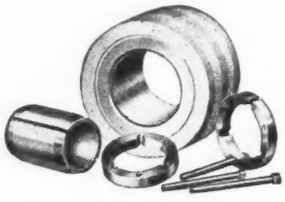
Potash Recovery—No. 1,494,029. May 13, 1924. S. W. Scofield, and J. B. La Rue, Cleveland, La Rue assignor to Scofield. Mineral silicates containing potash are treated with caustic alkali solution to convert the silicate into alkali-metal silicate and aluminate. The potash is then recovered by passing carbon dioxide, cold and under pressure, through the solution.

Oil-Well Pump—No. 1,497,558. June 10, 1924. J. J. Fitzpatrick, Tulsa, Okla. A traveling valve for the working barrel of an oil-well pump.

New Machinery and Inventions

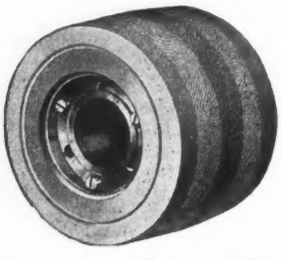
A Wood Rim Motor Pulley With an Iron Hub

A new motor pulley having an iron center and wood rim has been introduced by the Dodge Manufacturing Corporation, of Mishawaka, Ind. This pulley embodies the same principles of wood pulley construction that are used in the Dodge wood split pulley and is a development of the principle of compression fastening and interchangeability of bushing to shaft made use of in the Dodge standard iron split pulley and the Oneida steel split pulley. The hub construction is simple and the powerful wedge action is depended upon for securely fastening the pulley to the shaft.



Parts of new motor pulley

There are two principal parts, the slit iron hub and the wood rim. The hub comprises a slit bushing, two wedge rings, and three or more fillister head machine screws, according to the size of the hub.



New motor pulley assembled

The wood rim is made of select stock, laid up in segments and glued under heavy pressure. A seamless steel tube is forced into the wood rim and securely interlocked. This tube supports the rim and drives it through frictional contact with the wedge rings on the slit iron bushing.

The slit bushing is provided with a conical surface at both ends. When the screws are tightened, the wedge rings, which are also tapered, are brought together and become wedged between the steel tube in the rim and the slit bushing. The bushing is thus contracted on and held to the shaft by the wedge action of the rings.

The steel tubing provides a substantial backing for the wedge rings. The pulley is easily applied, and by tightening the screws, gradually and uniformly, it is securely fastened. Removal is as easily accomplished, and a screwdriver is the only tool required for both installation and removal. There are no set screws or keyways.

Miners' Hard Hats Improved

An improved form of miners' hard hat is manufactured and has recently been placed on the market by the E. D. Bullard Co., 525 Howard St., San Francisco, Calif. It is called the "Hard-boiled Miner's Hat." Although manufactured and in use for the last five years, the improved form is designed to give greater comfort to the wearer. Underground men have objected to the discomfort of wearing the usual form of hard hat, but the improved hat is as comfortable as the ordinary canvas cap. The new hat will withstand harder treatment and heavier blows. It is designed to give protection from falling rock or material and is a non-conductor of electricity, and is acid-proof and waterproof. Two styles are available, the regulation miner's cap and the southwester, which gives added protection to the neck and shoulders, as it has a stiff brim.

Electro-Pneumatic Control for Mine Hoist

An unusual and interesting application of control for a large mine hoist will be put in operation this fall by the Lehigh Coal & Navigation Co., of Lansford, Pa., at its No. 4 shaft. The installation will consist of a 1,200 hp. 300 to 293 r.p.m., 2,200 volt, three-phase, twenty-five cycle, wound-rotor induction motor, which will be controlled by electro-pneumatic unit switch type of contactor. This type of contactor is well adapted to the control of large induction motors, because of its strong construction, low maintenance cost, and positive operation. Each contactor is closed by air pressure against a powerful spring, the action of which produces positive closing and a quick break on opening.

The primary reversing contactors will consist of three two-pole elements, electrically and mechanically interlocked and mounted on a steel supporting frame, totally inclosed. The inclosing covers will be provided with a special design of muffler to deaden the noise which is a characteristic of all high-voltage air-break contactors.

The secondary accelerating contactors will consist of twenty-four unit switches mounted in three separate steel frames, thus giving nine points acceleration. These contactors will not be inclosed, as the only noise is caused by escaping air when the contactors open. Owing to the noiseless operation of the accelerating contactors and separation into three frames, they can be mounted near the motor with the grid resistors, thus utilizing waste space which will be a material saving in the cost of installation.

The action of the electro-pneumatic contactors is governed by the manipulation of a small master controller, the contacts of which control an electrically operated air valve on each unit switch.

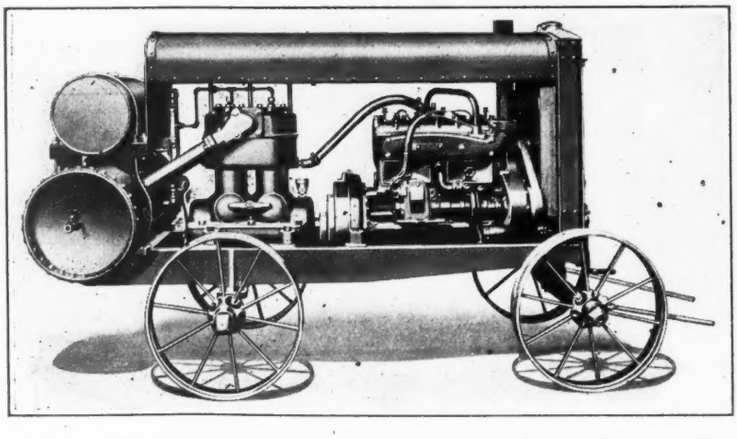
Automatic acceleration is secured by current limit accelerating relays, and the necessary transfer interlocks so that each switch will operate in the proper sequence and at the proper value of current.

Every safety feature is provided for the successful operation of the complete equipment. The failure of altering current power, air pressure, or control circuit and over-travel will immediately open all main switches and apply the hoist brakes.

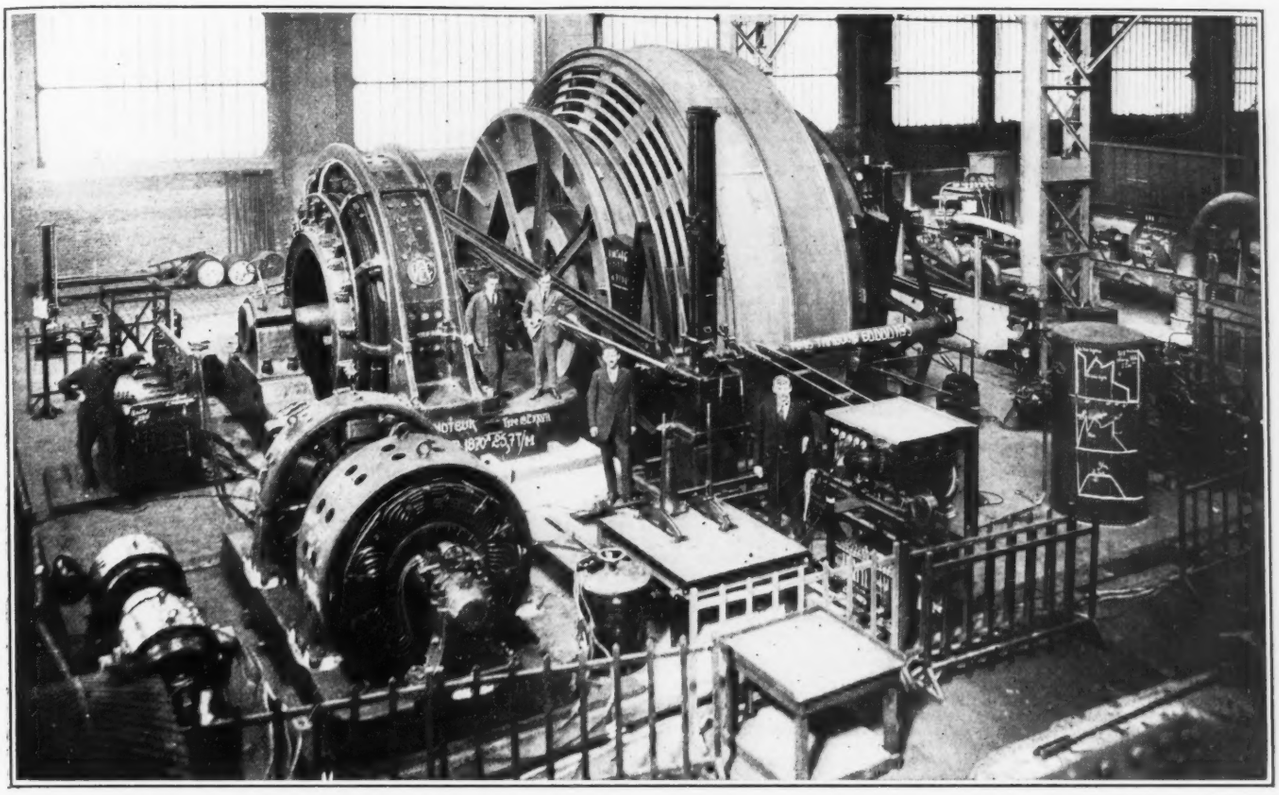
This control is the product of the Westinghouse Electric & Manufacturing Co., of East Pittsburgh, Pa.

Small Portable Compressor Developed

A small portable air compressor plant of modern design and construction has been developed by the Ingersoll-Rand Co., 11 Broadway, New York. This compressor, designated as the 4¼x4 in. Type Twenty, has a piston displacement of 60 cu.ft. per minute, and is built after the same general principle and design as the larger Type Twenty portables. All of the features of the larger units are retained—duplex, vertical compressor, direct-connected to a four-cylinder, four-cycle, tractor type gasoline engine; inclosed construction; circulating water cooling system for engine and compressor with sectionalized radiator, fan, and pump; compressor regulator and engine control for reducing speed during unloaded periods; one-piece cast-steel frame; sheet-steel roof, and removable side doors.



This small portable compressor has all features of the larger units



Electric hoist for Kaiping, China, Mines, on testing platform in shops at Charleroi, Belguim

Electric Hoists for Kaiping, China, Mines

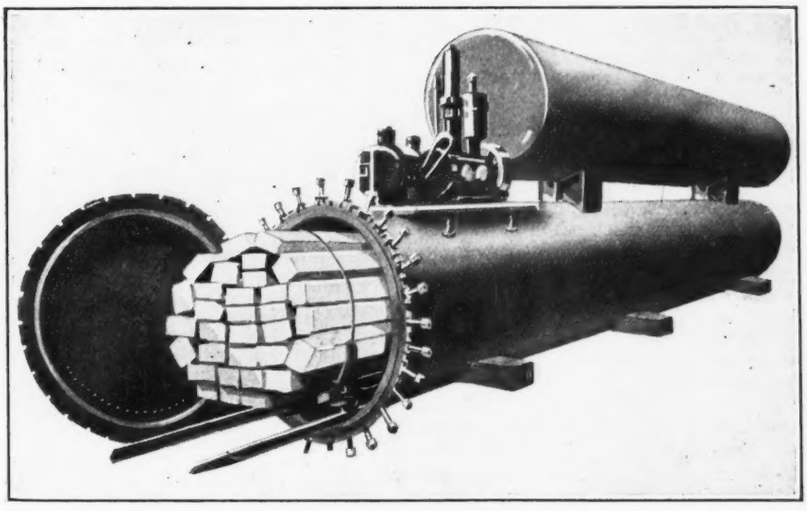
Electrical mine hoists designed for service in the Kaiping, China, mines have recently been built at the Charleroi electrical works, in Belgium, and have been made the basis of exhaustive experiments in those shops with a view to using these tests in connection with further export orders. The hoists are to operate at depths varying from 260 to 508 m., with a maximum load per cage of 5,500 kg. The usual load per cage is 4,500 kg.

Direct current at 500 volts is employed. The round steel hoisting rope is 51 mm. in diameter. The speed of the drums is 25.7 r.p.m., and the number of revolutions for a complete ascent is 24 for 508 m., 20.6 for 430 m., 17.25 for 350 m., and 13.5 for 260 m. The accelerating moment is 12.200 kgs., and the retarding moment 12.9 kgs.

There are two cylindro-conical drums, the initial diameter 5 m. and final diameter 7.6 m.

The electrical equipment includes one hoist motor and an independent exciter with auxiliary poles, type L.18.P. XXVII. In the exciter group there is a 60-hp. dynamo, type CBV70, 220 volts coupled to three-phase motor-type CAP-95, 1,500 r.p.m. There is one common frame for the motor dynamo.

Electric mine hoists are now in general use in Belgium, and those sent to Kaiping are of the latest type.



This timber-treating unit will handle 20,000 *board feet of sawed lumber per twenty-four-hour day*

An Up-to-date Plant for Timber Treatment on a Small Scale

A timber-treating plant of small capacity has been developed by Grant B. Shipley, Century Building, Pittsburgh, Pa., for the use particularly of those whose location or requirements make treatment at a large plant impracticable or uneconomical. The new unit is compact, self-contained, and complete in all requirements for treating timber by standard pressure processes using any of the recognized preservatives. It employs the Century air impregnating methods.

The unit is built in several sizes. The cylinder shown in the illustration has a capacity of 125 cross ties of average size, or 4,000 board feet of sawed lumber. When treating well-seasoned timber of most commercial species, two charges may be treated in a ten-hour shift, or five charges in twenty-four hours, or a capacity of 20,000 board feet of sawed lumber.

In the past, practically all small plants have been of the open-tank type, requiring in general the use of special and rather expensive preservatives. To secure thorough penetration, furthermore, the preservative must be forced into the wood under pressure, requiring, for the best results, the use of compressed air and vacuum application. This necessitates a suitably equipped closed cylinder. In the Shipley unit the treating cylinder is of a new type that is less expensive, fully as efficient, and more easily moved than the old style. On it is mounted, as shown in the illustration, the measuring and Rueping tank, also of a new type of construction. Cylinder and tank withstand a working pressure of 250 lb. per sq.in.

The Market Report

Daily Prices of Metals

June	Copper, N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
12	12.25	41.75	42.25	7.05	6.90@7.00	5.75@5.80
13	12.25	42.125	42.625	7.05	6.90@6.95	5.775@5.85
14	12.25	42.25	42.75	7.05	6.90@6.95	5.825
16	12.25@12.375	43.125	43.625	7.05	6.90@6.95	5.85
17	12.35	44.125	44.625	7.05	6.90@6.95	5.80@5.85
18	12.25@12.375	43.125	43.625	7.05	6.90@6.95	5.75@5.80
Av.	12.288	42.750	43.250	7.05	6.929	5.810

*These prices correspond to the following quotations for copper delivered: June 12th, 13th, and 14th, 12.50c.; 16th, 12.50@12.625c.; 17th, 12.60c.; 18th, 12.50@12.625c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
12	61 1/4	62 1/2	66 1/2	217	217	32 1/2	29 1/2	31 7/8	31 3/4
13	61 1/4	62 1/8	66	218 1/4	218 1/4	32 3/4	30 3/8	32 1/4	32
16	61 3/4	62 5/8	67	222	221 3/4	32 7/8	30 7/8	32 1/4	32 1/8
17	61 1/2	62 3/8	66 1/2	226	225 3/4	32 5/8	30 5/8	32 1/4	32
18	61 1/8	62	66	223 1/4	223	32 1/4	30 1/4	31 7/8	31 5/8

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

June	Sterling Exchange "Checks"	Silver		Gold London	June	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
12	4.30 7/8	66 3/8	34 11/16	95s 9d	16	4.32	67	34 7/8	95s 5d
13	4.31 1/4	66 7/8	34 7/8	95s 8d	17	4.32	67	34 7/8	95s 6d
14	4.31 3/8	66 3/4	34 13/16	.....	18	4.32	67 1/8	35	95s 6d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Metal Markets Quiet, With Few Price Changes

New York, June 18, 1924—The volume of business in the metal markets has been somewhat smaller than last week, no great demand being in evidence for any of the metals. Prices would no doubt have remained entirely unchanged except for the London market, which registered advances on Thursday, Friday, and Monday, most of which have been lost in the last two days.

Slight Advance in Copper

Following weakness in London and as a result of the apathy of the domestic buyers, some copper was sold at 12½c. delivered; in fact, that price was done every day in the week, though yesterday, the 17th, by far the largest volume of sales was at 12⅝c. Volume of business has again been below the current rate of production; the sales were considerably under those of last week, though some attractive orders were placed yesterday. Today, London is again down, so that offers of prompt copper have been made at 12½c. Most of the producers are, however, holding at 12⅝c.

Foreign sales have been very satisfactory, particularly to France. English dealers have also been in the market. The principal discouraging factor abroad is the presence of resale copper in German hands.

Copper consumption in the United States continues on a large scale despite the fact that many fabricators have somewhat curtailed their output and have not so many advance orders on their books as a few months ago. The immense production, rather than poor consumption, is to blame for the low level of copper prices. Present world copper production is only slightly below the peak of January, and every curtailment seems to be balanced by increases by other producers.

Lead Steady at Unchanged Prices

The official contract price of the American Smelting & Refining Co. continues at 7c., New York. Demand for lead has not been active during the week, but producers have so little to offer that no weakness in price is apparent. Most of the lead going into consumption just now has been sold on a contract basis at the fixed price of the leading interest or at the average price. Small quantities of lead in individual lots are available at 7c., New York, but most producers are asking from 7⅛ to 7¼c., and are getting these prices for occasional carloads. Consumers are not disposed to buy ahead to any extent. Foreign demand continues good and the European condition is reported especially strong fundamentally. There seems to be no difficulty in absorbing the entire Mexican production abroad.

The coming month or longer promises rather slack times in the automobile business, and this, of course, will adversely affect storage-battery makers. But this outlet has been restricted for the past month or two, battery makers even having asked for cancellations on some of their contracts, and running so far as possible on stocks.

In the Middle West at least one producer is holding firmly at 7c., St. Louis, but there has been a little more anxiety to sell the lead produced in Chicago, so that the St. Louis price cannot yet be said to have reached the even figure. There is no trouble in getting lead at 6.95c., St. Louis, and it is reported that this price has been shaded a little in Chicago.

Correction—The quotation for three months' lead in London, March 21, should have been 36⅜ instead of 36⅝ as was published in the March 29 issue.

Zinc Continues at London Parity

Demand for zinc has been weak, with prices around 5.80c., about 2½ points per month premium being demanded for forward shipments. Galvanizers have shown little interest in the market. Present prices are just about at London parity, so that occasional export shipments are being made. Brass makers have not been active buyers for some weeks. High-

grade zinc continues unchanged at 7¾@8¼c. per lb., delivered.

Tin Prices Advance Further

London tin prices have advanced every day in the week until today, and, of course, the quoted prices here have reflected this strength abroad. Demand, however, has been absent. Forward and spot tin have sold at the same prices. Arrivals of tin so far in June total 2,555 long tons.

Sterling and Francs Up

Improved political conditions in France were responsible for somewhat higher foreign exchange quotations. Closing cable quotations on Tuesday, June 17, were francs 5.37c., and lire 4.33c. Canadian dollars, 1 1/16 per cent discount.

Gold Reserves Again Increase

According to the June 1 circulation statement of United States money, stocks of gold coin and bullion were $4,460,181,615; standard silver dollars, $503,619,769; subsidiary silver, $277,316,407; United States notes, $346,681,016; Federal Reserve notes, $2,374,529,180; Federal Reserve Bank notes, $10,947,170; National Bank notes, $777,490,127; total, $8,750,765,284. In circulation, per capita, $42.78. The gold and silver stocks increased about $45,000,000, and the outstanding notes decreased about $71,000,000.

Silver Slightly Higher

The market has advanced slightly during the last week and the undertone appears good. London continues as the chief buyer, with orders for Continental account.

Mexican Dollars—June 12th, 51; 13th, 51⅛; 14th, 51⅛; 16th, 51⅛; 17th, 51⅛; 18th, 51⅛.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28@29c. per lb.; 98 per cent, 27@28c. London, £125 per long ton.

Antimony—Per lb.:
Chinese and Japanese brands, 8⅜@8½c.
W. C. C. brand, 11c.
Cookson's "C" grade, 12⅜c.
Chinese needle, lump, nominal, 8½@9c.
Better inquiry. Market abroad higher than here. China holding at higher level.

Bismuth—$2.35@$2.40 per lb. London, 10s.

Cadmium—60c. per lb. London, 2s. 6d.

Cobalt—$2.50@$3 per lb. for spot.

Iridium—$260@$270 per oz.
Iridium alloyed with platinum, $280@$286.

Nickel—27c. per lb. for 99 per cent virgin metal. London, £135 long ton.

Osmiridium—Crude, $58.50 per oz.

Osmium—$95@$104 per oz.

Palladium—$78@$83 per oz. Crude, $60 per oz.

Platinum:
Refined, $116 per oz.
Crude, $112@$114 per oz.

Quicksilver—$73@$74 per 75-lb. flask. San Francisco wires $72; London, £13¾. Supply scant; demand scantier.

Rhodium—$85@$90 per oz.

Ruthenium—$40@$45 per oz.

The prices of **Magnesium, Molybdenum, Monel Metal, Radium, Selenium, Tellurium, Thallium, and Tungsten** are unchanged from prices given in the June 7 issue.

Metallic Ores

Chrome—$19@$22, depending upon grade and source. Nominal.

Manganese—42@46c. per long ton unit, seaport, c.i.f. Nominal.

Molybdenum—80c. per lb. of MoS_2 for 85 per cent concentrates. Nominal.

Tungsten Ore—Per unit, N. Y.
High-grade wolframite, $9@$9.25.
High-grade scheelite, $9.25.
Ordinary grades, $8.50@$8.75. Nominal.

Iron Ore, Magnetite, Tantalum, and **Vanadium** are unchanged from June 7 quotations.

Zinc and Lead Ore Markets Exhibit Close Buying

Joplin, Mo., June 14, 1924—Zinc blende, per ton, high, $41.90; basis 60 per cent zinc, premium, $40@$41; Prime Western, $39@$40; fines and slimes, $38@$36; average settling price, all zinc ores, $38.58.

Lead, high, $91.75; basis 80 per cent lead, $80; average settling price, all lead ore, $81.05 per ton.

Shipments for the week: Blende, 11,851; lead, 1,533 tons. Value, all ores the week, $586,140.

Buyers have lowered their ownership of ore in the bins at the mines to practically one week's shipment supply. They are buying each week approximately the requirements for shipment the following week. It is the closest buying practiced in several years. This is owing to the prices they are compelled to pay to secure the ore, prices that it is claimed the metal market will not sustain, but sellers maintain that they can accept no lower figures and continue to operate the mines. The last week of May this year ore prices averaged $2 per ton higher than the last week of May last year, with slab zinc almost one cent lower average for May this than for last year.

Platteville, Wis., June 14, 1924—Blende, basis 60 per cent zinc, $42@$42.75 per ton. Lead, basis 80 per cent lead, $82.50 per ton. Shipments for the week: Blende, 635 tons; lead, 40 tons. Shipments for the year: Blende, 12,739; lead, 462 tons. Shipments for the week to separating plants, 1,476 tons blende.

Non-Metallic Minerals

Borax—Carload lots in bags, per lb. delivered:
Granulated or powdered, 4¾c.
Crystals, 5c.

Feldspar—Per long ton, *North Carolina:*
No. 1 ground—$15.32@$21.
No. 2 Crude—$4.50@$5.
In *Tennessee*, per short ton:
No. 1 ground—$15.32@$21.
Inferior grades—$11@$16.
Wide range in price caused by differences in quality and fineness of grinding.

Manjak—Barbados, 1 to 5 ton lots:
Grade "A," 6c. per lb.
Grade "AC," 7c. per lb.
Grade "AA," 8c. per lb.
Grade "C," 9c. per lb.
Market active.

Asbestos, Barytes, Bauxite, Beryl, Chalk, China Clay, Diatomaceous Earth, Emery, Flourspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Gypsum, Ilmenite, Limestone, Magnesite, Mica, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Rutile, Silica, Sulphur, Talc, Tripoli and **Zircon** are unchanged from June 7 prices.

Mineral Products

Arsenious Oxide (white arsenic)—8@8¼c. per lb.

Copper Sulphate—4.60@4.70c. per lb.

Potassium Sulphate, Sodium Sulphate, Sodium Nitrate and **Zinc Oxide** are unchanged from the June 7 prices.

Ferro-Alloys

Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and **Ferrovanadium** are unchanged from the prices given in the June 7 issue.

Metal Products

Copper—Sheets, 20¼c. base; wire, 15¼c.

Lead Sheets—Cut, 11c.; full, 10¾c. per lb.

Nickel Silver—18 per cent Grade A sheets, 26¼c.

Yellow Metal—Dimension sheets, 17¾c.; rods, 14¾c.

Zinc Sheets—Base price, $9.50 per 100 lb., f.o.b. plant.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick and **Zirkite** are unchanged from June 7 prices.

The Iron Trade

Pittsburgh, June 17, 1924

The volume of steel buying has undergone little change in a month and a half. Stocks of steel in buyers' hands are nearly all liquidated. Prices are holding very well in the circumstances. Bars, shapes, and plates remain at 2.20c. in the Pittsburgh market. Sheets are much steadier, the leading interest now selling at $4 a ton below its old prices, and only a few independents are going beyond that. Pipe is firm and wire products are fairly steady.

Pig Iron — Valley furnaces have dropped to $19.50 on foundry iron, and the former nominal quotation of $20, Valley, on basic, may be replaced by an appraisal of $19 as the price buyers could no doubt do. Bessemer remains at $21.50, Valley.

Connellsville Coke. — The Fairmont, W. Va., byproduct coke interest is now supplying a merchant furnace previously getting its coke from the Connellsville region, which now offers furnace coke freely at $3.25. A sale of 8,000 tons, for the requirements of Dover furnaces for the second half of this month, has been made at $3.25, and this price could probably be shaded now. Foundry coke remains at $4.50 to $5, but is easier.

Company Reports

International Nickel Co.

A net profit of $1,206,786.67 was earned by the International Nickel Co. during the fiscal year ended March 31, 1924. Four dividends of 1¼ per cent each were paid on the preferred stock of the company. The company's report states that concerted effort by a research, development, and sales organization has demonstrated that nickel may now be classified as a necessary engineering metal rather than an ordnance metal, and this opinion is confirmed by the many new uses and diversified applications of nickel and nickel alloys made during the last year.

Consolidated General Balance Sheet

		1924	1923
Assets			
Property account		$60,958,373.90	$60,466,017.66
Depreciation reserve	$7,575,309.76		6,955,283.11
Depletion reserve	2,609,960.21		2,220,542.29
		$10,185,269.97	$9,175,825.40
		$50,773,103.93	$51,290,192.26
Investments		$236,459.42	$571,769.90
Current assets		11,830,956.98	10,217,031.25
		$62,840,520.33	$62,078,993.41
Liabilities			
Capital stock			
Preferred 6 per cent non-cumulative		$8,912,600.00	$ 8,912,600.00
Common		41,834,600.00	41,834,600.00
Total		$50,747,200.00	$50,747,200.00
Current liabilities		947,833.76	779,076.22
Insurance and contingent reserve		395,645.07	516,049.96
Surplus March 31, 1924		10,749,841.50	10,036,667.23
		$62,840,520.33	$62,078,993.41

Consolidated General Profit-and-Loss Statement

		1924	1923
Earnings of all properties		$2,803,783.84	$1,153,321.99
Other income		221,870.56	128,949.80
Total		$3,025,645.40	1,282,271.79
Deduct administrative and head office expense		$563,381.54	$435,182.52
Net operating income		$2,462,272.86	$847,089.27
Deduct Orford Works property and shutdown expense	$103,029.10		389,191.24
Depreciation and depletion	1,138,457.09		394,727.81
Foreign companies not included	14,000.00		15,000.00
		$1,255,486.19	$798,919.05
Profit for the year		1,206,786.67	48,170.22
Surplus April 1, 1923		$10,036,667.23	$10,015,840.39
Profit for the year as above		1,206,786.67	48,170.22
Adjustments		41,143.60	507,412.62
Dividends preferred		$11,284,597.50	$10,571,423.23
		534,756.00	534,756.00
Surplus, March 31, 1924		$10,749,841.50	$10,036,667.23

Quincy Mining Co.

Copper; Michigan.

Quincy Mining shows a deficit of $278,824.91 for 1923 as follows:

Copper sales		$1,914,115.59
Profit on silver		76,701.81
Total		$1,990,817.40
Mining expense	$1,686,942.65	
Opening mine expense	153,796.14	
Taxes paid in Michigan	98,864.89	
Capital stock tax	4,243.00	
Smelting, transportation, and other charges	248,781.52	
		$2,192,628.20
Deficit		$201,810.80
Interest receipts	$11,992.89	
Sales of real estate, Hancock, Mich	64.60	
		12,057.49
		$189,753.31
Construction	$65,071.60	
Accident account	24,000.00	
		89,071.60
Deficit		$278,824.91

Product of the mine was 22,371,330 lb. of mineral, yielding 13,000,733 lb. of refined copper.

The statement of assets and liabilities in the last report showed the following balance on hand:

Jan. 1, 1923		$1,545,507.96
Deduct deficit for 1923	$278,824.91	
Additional income tax for 1916 and 1917	81,000.00	
		359,824.91
Gives balance of assets Jan. 1, 1924		$1,185,683.05

Greene Cananea Copper Co.

Copper; Mexico

Greene Cananea shows a loss of $155,932 for its 1923 operations. Production during 1923 was 41,991,369 lb. of copper, 1,149,410.8 oz. of silver, and 9,097.893 oz. of gold.

The cost of refined copper for the year 1923, including all expenses chargeable against production, was 14.5164c. per lb. Of this 1.477c. per lb. represented taxes and imposts paid in Mexico. The price received for the refined copper was 14.4103c. per lb.

After extended experimentation during a period of more than a year, selective flotation is now being tried out in the concentrator. By this method, the barren pyrite, which exists in large quantity in the concentrating ores, is thrown out in the tailing. Selective flotation should decrease the cost of producing copper, not only because the tonnage to be smelted is decreased but because it is cheaper to smelt in reverberatory furnaces than in blast furnaces under present conditions.

Balance Sheet, Dec. 31, 1923

Assets		
Fixed		
Mines and mining claims, lands, railways, buildings and equipment	$52,238,300.20	
Investments in sundry companies	80,886.31	$52,319,186.51
Current		3,228,447.13
Total		$55,547,633.64
Liabilities		
Capital stock		
Authorized—600,000 shares of $100 each		
Issued—500,000 shares		$50,000,000.00
Reserves		
Depreciation	$533,127.72	
Mexican legal reserve	4,000.00	537,127.72
Current		
Accounts and wages payable and taxes accrued		1,196,788.15
Surplus		
Balance Dec. 31, 1922	$3,969,649.82	
Net loss—1923	155,932.05	3,813,717.77
		$55,547,633.64

Income Account

Income		
Sales of metals		$6,336,699.90
Miscellaneous receipts		160,617.98
		$6,497,317.88
Expense		
Mining	$3,080,146.42	
Reduction	2,566,806.44	
Refining and selling	847,650.07	
Administration and U. S. federal taxes	260,574.06	
Metals in process and on hand at beginning of year	949,978.48	
Total	$7,705,155.47	
Metals in process and on hand at end of year	1,513,100.02	$6,192,055.45
Operating profit		$305,262.43
Expenditure on buildings and equipment written off		376,036.12
		$70,773.69
Interest paid		85,158.36
Balance—Net loss for year, carried to balance sheet		$155,932.05

The New Jersey Zinc Co.

For the quarter ended March 31, 1924, The New Jersey Zinc Co. reports as follows:

Income (including dividends from subsidiary companies) after deductions for expenses, taxes, maintenance, repairs, depreciation, depletion, and contingencies	$1,840,849.74
Deduct interest on first-mortgage bonds	40,000.00
Net income	$1,800,849.74
Deduct dividend, 2 per cent, payable May 10, 1924	979,632.00
Surplus for the quarter	$821,217.74

Isle Royale Copper Co.

Copper; Michigan

A report of the operations of the Isle Royale Copper Co. for 1923 states that copper production was 8,002,244 lb.

Production Costs

Mining		9.87c. per lb.	$789,515.82
Smelting and refining		.91c. per lb.	73,012.15
Boston office and mine and corporation taxes		1.57c. per lb.	133,987.73
Depreciation and depletion		3.81c. per lb.	304,592.96
Production cost of	8,002,244 lb. at	16.26c. per lb.	$1,301,108.6
On hand Jan. 1, 1923	1,180,980 lb. at	14.19c. per lb.	167,526.40
	9,183,224 lb.		$1,468,635.06
Sold in year	6,158,182 lb.		976,784.48
			$491,850.58
Less to reduce to market value			94,813.82
On hand Dec. 31, 1923	3,025,042 lb. at	13.125c. per lb.	$397,036.76

Earnings Statement

Received for copper sold	6,158,182 lb. at	14.84c. per lb.	$914,083.35
Cost of copper sold			
Production cost at 15.86c.	$976,784.48		
Selling and delivery cost at 0.47c.	29,155.42 at	16.33c. per lb.	1,005,939.90
Loss on copper sold		1.49c. per lb.	$91,856.55
Loss by reduction to market value			94,813.82
			$186,670.37
Loss by reduction to market value			94,813.87
			$186,670.37
Miscellaneous receipts and interest		$23,545.45	
Miscellaneous expenses		15,343.16	8,202.29
Loss for year			$178,468.06

Changes in Net Current Assets

Balance of current assets Jan. 1, 1923			$1,245,365.33
Loss for year	$178,468.08		
Less depreciation and depletion reserves	$304,592.96		
Less depreciation	6,279.86		
Net increase in reserves for year	298,313.10	$119,845.02	
Capital assets			
Plant increased—new construction	$2,872.53		
Plant decreased by sales and obsolescence	11,089.50		
Net decrease in capital assets	$8,216.97		
Dividends paid			
March 15, 1923	$75,000.00		
June 15, 1923	75,000.00		
Sept. 15, 1923	75,000.00	225,000.00	216,783.03
Net decrease in current assets			96,938.01
Balance of current assets Dec. 31, 1923			$1,148,427.32

Comparative Results for the Last Four Years

	1920	1921	1922	1923
Tons of rock treated	591,971	116,576	246,641	308,940
Cost of mining, transportation, stamping and taxes per ton of rock	$2.73	$2.62	$2.36	$2.88
Pounds of refined copper produced	10,621,801	2,491,000	6,639,970	8,002,244
Pounds of refined copper per ton of rock treated	17.94	21.37	26.92	25.90

West End Consolidated Mining Co.

West End Consolidated made an operating profit of $468,107.05 during 1923, according to the following statement:

General Operating Statement

		Total	Per Ton
Dry tons ore milled from West End mine		70,458	
Containing fine ounces gold	12,239.80		
Containing fine ounces silver	1,128,135.99		
Gross value West End ore milled		$1,212,011.29	$17.20
Milling costs—direct and indirect	$207,608.11		2.95
Tailing losses	96,608.84		1.37
Bullion marketing	18,730.13		.26
Mining costs—direct and indirect	337,984.99		4.80
Mine development cost	74,598.75		1.06
Ore transportation cost	13,948.08		.20
Total deductions		749,478.90	$10.64
Total operating profit West End mine		462,532.39	6.56
Miscellaneous earnings		26,541.94	
Total earnings		$489,074.33	
Miscellaneous expenses, including depreciation		20,967.28	
Net profit from Tonopah operations		$468,107.05	

Condensed Balance Sheet, Dec. 31, 1923

Assets

Property, less depletion reserve		$4,447,654.21
Investments (at cost)		
Stock of controlled companies	$491,464.87	
Stock of West End Chemical Co. and other companies	1,485,090.15	
Liberty bonds	5,000.00	
		1,981,555.02
Advances		29,479.73
Current assets		137,232.76
Deferred		
Capital stock discount	$6,335,306.39	
Litigation	65,692.03	
Prepaid insurance	2,311.49	6,403,309.91
		$12,999,231.63

Liabilities and Capital

Capital stock and earned surplus		
Capital stock outstanding	$8,942,430.00	
Earned surplus	2,029,872.41	
		$10,972,302.41
Surplus arising from adjustment of property values		1,929,176.99
Current liabilities		97,752.23
		$12,999,231.63

Lucky Tiger-Combination Gold Mining Co.

The Lucky Tiger-Combination Gold Mining Co. and the Tigre Mining Co., S. A., in their annual report for 1923 show dividend payments for the year of $765,410.59.

During the last year, 74,946.14 tons of ore was treated in the concentrator. The ore assayed 0.16 oz. in gold, 39.23 oz. in silver, 0.47 per cent copper and 1.41 per cent lead.

The average price received for silver was 64.9c. per oz. compared with 67.4c. during 1922.

The new mill has been giving excellent results; cost per ton is now below the original estimate and extraction is better. The total cost of remodeling the old mill will be paid back through lower cost and better extraction, by the end of 1924, and possibly sooner.

Consolidated Income Account for 1923

Gross operating income		$2,258,121.13
Deduct cost of operation		1,359,599.72
Net operating income		$898,521.41
Income from other sources		94,246.34
Total		$992,767.75
Deduct		
Administrative expenses	$52,246.97	
Examining new properties	10,492.08	
Depreciation	34,113.95	
Total	$96,853.00	
Provision for state income tax	127.82	
Provision for federal income tax	36,707.65	
		133,688.47
Net income, including capital realizations		$859,079.28
Add balance of reserve for inventory depreciation returned		13,028.09
		$872,107.37
Deduct appropriated net income for reserve for hospital deficit		4,000.00
		$868,107.37
Surplus from realizations disposed as follows:		
Dividends paid from earned surplus	$395,640.93	
Carried to capital surplus realized	472,466.44	
		$868,107.37

Consolidated Balance Sheet Dec. 31, 1923

Assets

Current assets	$1,586,493.71
Development fund	476,493.36
Mineral property	3,148,274.57
Plant, machinery and equipment	113,750.00
Los Chinos Unit—The Tigre Mining Co., S. A.	42,665.45
The Adjust Mining Co.	16,336.30
The Cosmos mine	2,314.99
Real estate and residence—Douglas, Ariz.	8,000.00
Apache Powder Co.—stock	6,000.00
Furniture and fixtures—Kansas City	250.00
Claim against Mexican Government	59,452.79
El Tigre hospital deficit	4,014.41
Deferred charges to operations	6,250.50
	$5,470,296.08

Liabilities

Current liabilities		$127,033.68
Reserves		172,044.26
Capital stock issued and outstanding—715,337 shares	$7,153,370.00	
Less excess of dividends paid over earned surplus. Balance	1,982,151.86	5,171,218.14
Capital surplus		
Arising from appreciation in value of investment in Tigre Mining Co., S. A.	$6,500,000.00	
Less stock dividend paid Oct. 15, 1909	6,500,000.00	
		$5,470,296.08

Mining Stocks

Week Ended June 14, 1924

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Alaska-Br. Col.	N. Y. Curb	...	...	*10	...	...
Anaconda	New York	31⅛	28⅞	29⅛	De.15, Ja.21, Q	0.75
Arcadian Consol.	Boston	*80	*80	*80	...	...
Ariz. Com'l	Boston	8¼	8¼	8¼	Ja.15, Ja.31	0.50
Calaveras	N. Y. Curb	2⅛	1⅞	2⅛	...	...
Calumet & Arizona	Boston	44	44	44	Jn. 6, Ju. 23 Q	0.50
Cal. & Hecla (New)	Boston	14¾	14¼	14¼	My. 31, Jn. 16	0.50
Canario Copper	N. Y. Curb	2½	2½	2⅜	...	...
Cerro de Pasco	New York	45½	44⅜	45	Ap. 17, My. 1	1.00
Chile Copper	New York	27⅜	27¼	27⅜	Jn.2, Jn.30, Q	0.62½
Chino	New York	17	16⅜	16⅛	Sept., 1920,	0.37½
Con. Coppermines	N. Y. Curb	2¼	2	2¼	...	...
Copper Range	Boston	20	19¼	20	May, 1923	1.00
Crystal Copper	Boston Curb	*56	*56	*56	...	...
Davis-Daly	Boston	*50	*50	*50	Mar., 1920	0.25
East Butte	Boston	4	3¾	3⅞	Dec., 1919	0.50
First National	Boston Curb	*25	*23	*23	Feb., 1919,	0.15
Franklin	Boston	†*90	...	...	...	...
Gadsden Copper	Boston Curb	*60	*45	*60	...	...
Granby Consol.	New York	13½	12⅞	13⅜	May, 1919	1.25
Greene-Cananea	New York	11⅛	10⅝	11⅛	Nov., 1920	0.50
Hancock	Boston	1¼	1	1⅛	...	...
Howe Sound	N. Y. Curb	2½	2⅜	2⅜	Ap.1, Ap.15, Q	0.05
Inspiration Consol.	New York	23⅝	23	23⅜	De.20, Ja.7, Q	0.50
Iron Cap	Boston Curb	3	3	3	May, 1923	0.15
Isle Royale	Boston	12½	12¼	12½	Se. 1, Se. 15,	0.50
Jerome Verde Dev.	N. Y. Curb	1	1	1	...	...
Jib Consol.	N. Y. Curb	*42	*32	*39	...	...
Kennecott	New York	38⅜	37⅜	37⅜	Jn.6, Jy. 1, Q	0.75
Keweenaw	Boston	*50	*50	*50	...	...
Lake Copper	Boston	†1	...	...	...	...
Magma Copper	New York	27½	26½	26⅝	Jan., 1919	0.50
Mason Valley	N. Y. Curb	1⅜	1¼	1¼	...	...
Mass Consolidated	Boston	†*0	...	...	Nov., 1917	1.00
Miami Copper	New York	20½	20	20½	My. 1, My. 15, Q	0.50
Mohawk	Boston	25	24½	24½	Se. 22, Oc. 13,	1.00
Mother Lode Coa.	New York	7⅜	6¾	6⅞	Jn.13, Jn.30	0.37½
Nevada Consol.	New York	13	13	13	Sept., 1920,	0.25
New Cornelia	Boston	18⅜	18	18	My.9, My.26,	0.25
New Dominion	N. Y. Curb	...	...	2⅜	...	...
North Butte	Boston	3¼	3⅛	3 7/16	Oct., 1918,	0.25
Ohio Copper	N. Y. Curb	*95	*87	*93	...	...
Old Dominion	Boston	17½	17	17⅛	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†105	†100	....	Jn.21, Jy.2 Q	1.00
Quincy	Boston	14⅞	14	14⅛	Mar., 1920	1.00
Ray Consolidated	New York	10⅛	10	10	Dec., 1920	0.25
Ray Hercules	N. Y. Curb	...	...	*13	...	...
St. Mary's Min. Ld.	Boston	27⅛	26⅛	26⅛	Ap.22, My.20	3.00
Seneca Copper	New York	⅜	⅜	⅜	...	...
Shannon	Boston	†*35	...	...	Nov., 1917	0.25
Shattuck Arizona	New York	4⅞	4⅜	4⅜	Jan., 1920	0.25
Superior & Boston	Boston	*65	*61	*65	...	...
Tenn. C. & C. cfs.	New York	7	6⅞	6⅞	De.31, Ja.15, Q	0.25
Utah Copper	New York	68⅛	67½	68⅛	Jn.13, Jn.30,	1.00
Utah Metal & T.	Boston	*25	*25	*25	Dec., 1917	0.30
Victoria	Boston	*50	*50	*50	...	...
Walker Mining	N. Y. Curb	...	...	2⅜	...	...
Winona	Boston	*25	*18	*18	...	...
NICKEL-COPPER						
Internat. Nickel	New York	14½	13⅜	14	Mar., 1919	0.50
Internat. Nickel pfd.	New York	80¼	80	80¼	Ap.17, My.1, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	3	2⅛	2⅛	...	...
National Lead	New York	139⅞	131	137½	Jn.13, Jn.30, Q	2.00
National Lead pfd.	New York	...	...	112½	My. 23, Ju. 14, Q	1.75
St. Joseph Lead	New York	25½	24¾	25⅛	Se. 9, Se.20	0.50
ZINC						
Am. Z. L. & S.	New York	7⅛	7	7⅛	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	25	25	25	Nov., 1920	1.50
Butte C. & Z.	New York	4⅜	4⅜	4⅜	Mai., 1923	0.50
Butte & Superior	New York	15¼	14⅜	14⅜	Je.15, Je. 30, Q	0.50
Callahan Zn-Ld.	New York	3¼	3	3⅛	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	140¼	139	140⅜	May 10, 1924	2.00
United Zinc	N. Y. Curb	...	...	*25	...	...
Yellow Pine	Los Angeles	67½	65	67½	Mar., 1924	0.04
SILVER						
Alvarado	N. Y. Curb	...	...	1	...	...
Beaver Consol.	Toronto	*18½	*17⅞	*17⅞	May, 1920	0.03
Castle-Trethewey	Toronto	*67¼	*65	*66	...	...
Coniagas	Toronto	1.85	1.70	1.70	Ap.20, My.1	0.02½
Crown Reserve	Toronto	*55	*51	*55	Jan., 1917	0.05
Keeley	Toronto	2.34	2.32	2.32	...	...
Kerr Lake	N. Y. Curb	1⅜	1⅛	1⅛	Ap.1, Ap.15, Q	0.12
La Rose	Toronto	*10	*9½	*9½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	†1.30	†1.30	1.35	...	...
McKinley-Dar.-Sav.	Toronto	*12½	*11½	*11½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.90	2.85	2.90	Sept., 1919	0.12½
Nipissing	N. Y. Curb	6	6	6	Mc.1, Ap.21, Q	0.03½
Ontario Silver	New York	6½	6½	6½	Jan., 1919	0.50
Temiskaming	Toronto	6.20	6.15	6.20	Jan., 1920	0.40
GOLD						
Alaska Gold	New York	15	12½	12½	...	...
Alaska Juneau	New York	1½	1⅜	1⅜	...	...
Argonaut	Toronto	*47½	*46	*47½	...	...
Carson Hill	Boston	1⅛	1⅛	1⅛	...	...
Cresson Consol. G	N. Y. Curb	...	...	3⅛	Mc.3, Ap.10, Q	0.10
Dome Mines	New York	17⅜	16½	17⅜	Jn.26, Jy.21, Q	0.50
Golden Cycle	Colo. Springs	127	127	1.27	My.31, Jn.10 Q	0.03
Hollinger Consol.	Toronto	13.00	12.60	13.00	My.29, Jn.16, M	0.05
Homestake Mining	New York	46	44	44	Jn.20, Jy.25,	0.50
Kirkland Lake	Toronto	*20	*17	*19½	...	...
Lake Shore	Toronto	3.70	3.61	3.70	My.2, My.15	0.02
McIntyre-Porcupine	New York	16	15⅜	15⅜	Ap. 1, My. 1,	0.25
Newray	Toronto	*30	*28½	*28½	...	...
Portland	Colo. Springs	...	...	58	Oct., 1920	0.01
Teck-Hughes	Toronto	1.12	1.07	1.10	...	...
Tom Reed	Los Angeles	34⅜	31	34⅜	Dec., '1919	0.02
Tough-Oakes	Toronto	*64	*62	*63½	...	...
United Eastern	N. Y. Curb	*60	*57	*58	Ap 10, Ap.28, Q	0.10
Vipond Cons.	Toronto	1.03	1.03	1.03	...	...
Wright-Hargreaves	Toronto	3.15	3.10	3.10	Jn.16, Jy. 1, Q	0.02½
GOLD AND SILVER						
Black Oak	N. Y. Curb	*77	*73	*77	...	...
Con. Cortez	N. Y. Curb	*38	*28	*31	...	...
Con. Virginia	San Francisco	4½	4½	4½	...	...
Continental Mines	N. Y. Curb	2	2	2	...	...
Dolores Esperanza	N. Y. Curb	...	...	*50	Jy. 1, Jy. 10 Q	0.05
Premier Gold	N. Y. Curb	1⅞	1⅞	1⅞	Jn.19, Jy.2	0.08
Tonopah Belmont	N. Y. Curb	*58	*55	*55	Apr., 1925	0.05
Tonopah Divide	N. Y. Curb	*21	*21	*21	Se.22, Oc. 10	0.10
Tonopah Extension	N. Y. Curb	2½	2⅜	2½	Jn. 10, Jy. 1	0.05
Tonopah Mining	N. Y. Curb	1 1/16	1 1/16	1 1/16	Ap. 6, Ap. 21	0.07½
Unity Gold	N. Y. Curb	1	*90	*90	...	...
West End Consol.	N. Y. Curb	...	...	*44	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*50	*50	*50	June, 1918	0.02
SILVER-LEAD						
Ahumada	Boston Curb	5⅜	5⅜	5⅜	Jn.16, Jy. 2, X	0.15
Bingham Mines	Boston	14	14	14	Sept., 1919	0.25
Cardiff M. & M.	Salt Lake	*92	*90	*90	Dec., 1920	0.15
Chief Consol.	Boston Curb	3 7/16	3⅜	3 7/16	Ap 19, My. 1, Q	0.10
Columbus Rexall	Salt Lake	20	20	20	Aug., 1922	0.03
Consol. M. & S.	Montreal	39	36½	36½	Oct., 1920	0.62½
Daly Mining	Salt Lake	...	...	205	July, 1920	0.10
Erupcion	Boston Curb	2⅜	2⅜	2⅜	Jn. 16, Jy. 2, X	0.15
Federal M. & S.	New York	8¼	8¼	8¼	Jan., 1909	1.50
Federal M. & S. pfd.	New York	42	42	42	My.26, Jn.15, Q	1.75
Florence Silver	Spokane	11	10½	11	Apr., 1919, QX	0.01
Hecla Mining	N. Y. Curb	9	8⅞	9	My.15, Jn.15,	0.25
Iron Blossom Con.	N. Y. Curb	...	...	*26	Oct., 1923	0.02
Marsh Mines	N. Y. Curb	*7	*7	*7	June, 1921	0.02½
Park City	Salt Lake	....	....	4.00	Mar., 1924	0.15
Park Utah	N. Y. Curb	...	...	3½	Mc.15, Ap.1	0.15
Prince Consol.	Salt Lake	*8½	*7	*8½	Nov., 1917	0.02
Silver King	N. Y. Curb	...	...	*60	Ap. 1, X	0.30
Silversmith	Spokane	*40	*34	*34½	Jn.1, Jn. 10,	0.01
Tamarack-Custer	Spokane	1.57	1.50	1.50	Se.30, Oc. 1, K	0.02
Tintic Standard	Salt Lake	4.62½	4.47½	4.47½	Jy.28, '24, X	0.15
Utah-Apex	Boston	2⅛	2⅛	2⅛	June, 1923,	0.50
IRON						
Bethlehem Steel	New York	48½	45½	46½	Jn.1, Jy.1, Q	1.25
Char. Iron	Detroit	....	....	⅜	...	...
Char. Iron pfd.	Detroit	...	...	1	...	...
Colorado Fuel & Iron	New York	42⅝	38⅜	41⅛	My.10, My.26	Q 2.00
Col. Fuel & Iron pfd.	New York	...	...	102	Feb., 1923	2.00
Gt. North'n Iron Ore	New York	26½	26⅛	26½	De.10, De.27	2.00
Inland Steel	N. Y. Curb	....	....	46	My.15, Jn. 1 Q	0.62½
Mesabi Iron	N. Y. Curb	...	...	2⅜	...	...
Replogle Steel	New York	7⅜	7⅛	7⅜	...	...
Republic I. & S.	New York	45⅛	42¼	44⅛	May, 1921	1.50
Republic I. & S. pfd.	New York	85	84	85	Jn.14, Jy.1, Q	1.75
Sloss-Sheffield S.&I.	New York	55	53	54⅜	Jn.6, Jn.20, Q	1.50
Sloss-Shef. S.&I.pfd.	New York	...	...	82	Jn.18, Jy.2, Q	1.75
U. S. Steel	New York	97½	94⅛	97	Jn.1, Jn.28	QX 1.75
U. S. Steel pfd.	New York	121⅛	119⅛	121⅛	My.6, My.29, Q	1.75
Virginia I. C. & C.	New York	36	36	36	De.15, Ja. 2	1.50
Virginia I.C.&C.pfd.	New York	76	76	76	Jn.17, Jy.1	2.50
VANADIUM						
Vanadium Corp.	New York	21⅞	19⅛	21⅛	Jan., 1921	1.00
ARSENIC						
Western Utah Copper	N. Y. Curb	*30	*29	*29	...	...
ASBESTOS						
Asbestos Corp.	Montreal	...	...	25½	Se.29, Oc.15 Q	1.00
Asbestos Corp. pfd.	Montreal	57½	57	57	Jy.1, Jy.16, Q	1.50
SULPHUR						
Freeport Texas	New York	8⅞	8½	8⅝	Nov., 1919,	1.00
Texas Gulf	New York	63	59	62⅝	My.31, Jn.14	QX 1.75
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	3⅛	3⅛	3⅛	...	...
MINING, SMELTING AND REFINING						
Amer. Metal	New York	40⅜	40⅛	40⅛	My.20, Jn.1, Q	0.75
Amer. Metal pfd.	New York	110	108½	110	My.20, Jn.1, Q	1.75
Amer. Sm. & Ref.	New York	63¾	61¼	62⅞	Ap. 11, My. 1, Q	1.25
Amer. Sm. & Ref. pfd.	New York	100	98¼	100	My. 9, Jn. 1,	1.75
U. S. Sm. R. & M.	New York	21	20¼	20¼	Jan., 1921,	0.50
U. S. Sm. R. & M. pfd.	New York	38⅞	38⅛	38⅞	Apr., 1924, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

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